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ABSTRACT

This volume demonstrates how technology is impacting management education and learning in a variety of educational contexts. Some of the issues and trends in management education addressed include: technotrends; web-based management learning; the changing nature of the web as a context for learning; online simulations; web-format case studies; e-portfolios; emphasizing human interaction; teaching soft management skills online; designing mobile learning for the wireless world; integrating enterprise resource planning (ERP) into business education; technology planning; and avoiding a dystopian future. The chapters are as follows: "Introduction: Emerging Technological Contexts of Management Learning" (Wankel, DeFillippi); "Educating Managers, Managing Education: Trends and Impacts of Tomorrow's Technologies" (Brussee et al.); "Learning and Teaching Management on the Web: What Do We Know?" (Arbaugh, Stelzer); "Online Simulations in Management Education about Information and Its Uses" (Rafaeli et al.); "Innovations in Web-Format Case Teaching: Leveraging Dynamic Information" (Clark); "Electronic Student Portfolios in Management Education" (Chappell, Schermerhorn Jr.); "The Place and Space Model of Distributed Learning: Enriching the Corporate e-Learning Model" (Gallagher); "Interpersonal Communication Training with Tomorrow's Technologies" (Henninger, Weingandt); "Mobile Scenarios: Supporting Collaborative Learning Among Mobile Workers: (Lundin, Nulden); " Global Management Education: The Case of ERP Enabled Business School Programs" (Reisel, Watson); "From Vision to Reality: A Model for Bringing Real-World Technology to the Management Education Classroom" (Hamlin et al.). Chapters contain substantial references. (MO)

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Educating Managers with Tomorrow's Technologies

A Volume in: Research in Management Education and Development

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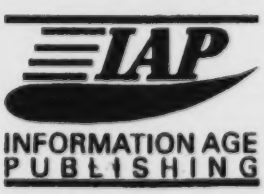

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INTRODUCTION

EMERGING TECHNOLOGICAL CONTEXTS OF MANAGEMENT LEARNING

Charles Wankel and Robert DeFillippi

The 21st Century is characterized by the transformation of every industry and many human activities by powerful new technologies. Management learning is a prime example. This volume demonstrates how technology is impacting management education and management learning in a variety of educational contexts. Beyond management education in universities and colleges, corporate-based training is a $365 billion market (Maloy, 2000). Donald Evans, Secretary of Commerce of the United States explained:

> Rapid advancements in the years ahead could enable new learning environments using simulations, visualizations, immersive environments, game playing, intelligent tutor and avatars, networks of learners, reusable building blocks of content, and more. The technologies that are coming could create rich and compelling learning opportunities that meet all learners' needs, and provide knowledge and training when and where they are needed, while boosting the productivity of learning and lowering its cost. (Evans, 2002).

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TECHNOTRENDS IN MANAGEMENT EDUCATION

e-Learning in the 21st century now includes transcending the boundaries of universities and corporations to partner with a variety of stakeholders. For example, firms are using e-learning to train their retailing partners how to resell their products and services most effectively (Parlin, 2003; Banhazl, 2002). In corporations, talent management—driving management education to keep the people of an organization in alignment with its changing requirements—will be the analytical engine of corporate management e-learning (Parlin, 2003). In their chapter, Brussee, Grootveld, and Mulder describe how e-learning is going from a closed model, with learners locked in encapsulated computer-based training contexts, to an open model in which integration with rest of the world is a priority. Courses increasingly will be cosponsored by firms from different sectors and industries (Pantazis, 2002).

The customization of management learning will increase in coming years. Learners will expect e-learning to be provided in their own languages, when they want it, with customized relevancies through case materials and simulations to their own industries and firms. The increasing use of electronic and virtual learning technologies might paradoxically require that educational institutions mandate non-electronic collaborations and interactions to foster forms of intercultural exchange and learning best provided through face-to-face interaction (Wettemann, 2003).

WEB-BASED MANAGEMENT LEARNING

Arbaugh and Stelzer's chapter notes that about eighty percent of American colleges and universities offer some form of Web-based education. Management textbooks are increasingly available in electronic versions. Such media often come with new sets of issues for management educators to grapple with. Electronic textbook-related material comes in CD form and on publishers' websites. University libraries increasingly provide reserve material as e-reserves accessible over the Web. Since publishers have copyright and other concerns about having journal articles and other publications available to individual users directly over the Net, policies and procedures for accomplishing this are evolving and diverse. For example, some electronic information distributors permit particular items to be offered as e-reserves for only a few days at a time while others enable an academic term or longer.

Arbaugh and Stelzer suggest that, just as instructors inexperienced in face-to-face teaching might not be as effective as more experienced instructors, the inexperience of instructors new to online teaching might be a

cause of some student dissatisfaction rather than only factors intrinsic to the technology itself. Similarly, younger learners raised in cyberculture align more readily with online course tasks than older students.

THE CHANGING NATURE OF THE WEB AS A CONTEXT FOR LEARNING

The Web itself evolves and Web-based learning is co-evolving with technological advances. For example, the increasing adoption of broadband Internet access by individuals enables the increased use of video streams and other high-bandwidth uses in e-learning. Platforms such as HorizonLive (http://www.horizonlive.com/) are licensed by universities and corporate learning departments to offer synchronous video coupled with PowerPoint, chat, whiteboard, and browsers. Live sessions conducted on HorizonLive can be archived and revisited by students. Evaluative data from spring 2003 St. John's University students suggest that the instructor's persona is seen differently when mediated through brief videos than when mediated through text-based communications such as email and discussion board postings. One student reported that she thought the instructor had a very friendly personality from the videos but saw the instructor as more business-like when considering his email.

ONLINE SIMULATIONS IN MANAGEMENT EDUCATION

Sheizaf Rafaeli, Daphne Raban, Gilad Ravid, and Avi Noy of the Center for the Study of the Information Society report in Chapter X on online simulations and games. Online and network-mediated simulations amplify many of the benefits provided by simulations and games in traditional pedagogic contexts.

Online management simulations can now use the extant contexts of such rich simulated environments as the Sims Online (*Sims Online*, 2003). That is, rather than using a conference call for a discussion, each manager in an online meeting might, with proper instruction, take on an avatar and meet in a virtual environment developed for more general interaction by tens of thousands of people. One advantage of such a medium for work is that it does away with many, perhaps misleading, non-verbal cues. It also might be inherently exciting for many managers and thus be energizing and motivating. VR environments for executive retreats have advantages for the executives. (Dörner, Grimm, & Seiler, 2001). Thus, one executive might participate from a European vacation, another from their office, and another from their home. Rather than a one-place-fits all site, online

simulated contexts allow immense geographic flexibility for participants. Such virtual simulations can provide accelerated training schedules and lower costs for organizations. When a learner makes a misstep, the learner can be immediately brought into a tutorial for remediation (Hinrichs, 2002).

Rafaeli et al. describe how the presence of others can be simulated in online auctions and how this simulated presence fosters improved participation. Such simulated social dimensions of management processes articulated through online stimuli may be at the core of future online management simulations. Recent research has found online simulations to foster improved performance by learners in comparison to learning by students in identical courses lacking online simulation (Cameron & Wijekumar, 2003).

Internet-based games can alleviate some weaknesses of non-networked computer-based and traditional face-to-face simulations. Indeed in 21st century business, managers will be interfacing with Internet mediated information rather than face-to-face with colleagues for an ever-increasingly proportion of their work. This is seen in the Internet version of the Beer Game described by Rafaeli et al. Management work occurs in increasingly globalized contexts. The Internet allows participants to interact with others in other nations.

WEB-FORMAT CASE STUDIES

New technologies, Clark explains in her chapter, is enabling management educators to create e-case studies that eclipse text-based ones in many ways. One way is the addition of videos and more visual media. Printed case studies for decades have included such visual elements as financial documents, photographs of production processes, organization charts, and tabular presentations of data. Web-based cases enable the use of videos of such things as interviews with key executives, employees, customers, and other stakeholders, sometimes in interactive formats (Hrabe, Kinzie, & Julian, 2001).

Web-format cases also enable the inclusion of hyperlinks to related material, for example, sources of information cited, perhaps even the page in a book or article. Hyperlinks that provide definitions of key terms is another use. One future use of web-format case studies might be the coordination of case study content across the curriculum. That is, a case study might be deployed with material available relevant for the course work of many courses. Students could follow links to the material relevant to marketing or the material relevant to human resource management decisions. In actual organizations, access to information beyond that required for a decision-maker in a particular functional area is similarly controlled.

In the future, more proprietary password-protected content will be included in Web-format cases. That is, data on corporate sites and in libraries constrained by copyright and privacy issues will be increasingly available. One of the characteristics of hypermedia is that each user can customize his/her passage through the material. As hyperlinks increase, the customization of the case studies will also increase. Instructors will then be advised to craft associated assignments to leverage and evaluate the information navigation skills that are central to 21st management. As automatic translation utilities improve, web-format cases will enable multi-lingual use.

E-PORTFOLIOS

Electronic student portfolios are discussed in Chappell and Schermerhorn's chapter. Such an e-portfolio is a compendium communicating the academic accomplishments and professional resume of a student. E-portfolios enable students to provide videotapes and other material displaying accomplishments in a way that paper-form student portfolios cannot. PowerPoint presentations, some with an appended audio presentation, can suggest to recruiters the types of presentations that students are capable of delivering as prospective managers. Indeed, an introductory link in the portfolio might provide an overview of the entire portfolio in a student's own voice. Thus, communication skills can be showcased. The ability to put an e-portfolio on the Internet makes it more readily available to potential employers.

EMPHASIZING HUMAN INTERACTION IN MANAGEMENT LEARNING

John Gallagher's chapter expands the framework for e-learning by placing greater emphasis on the social, collaborative, and human interaction core of learning and the new technologies that mediate it. He presents the Place and Space model developed during 1995-2000 at Duke University's Fuqua School of Business as the basis for an innovative Internet-mediated MBA programs integrating residential (place) and online (space) components. In 2000, Duke Corporate Education expanded the model for non-degree management development programs.

In the Place and Space model, people access people in an information-rich network environment. "People take center stage and content is assigned a supporting role." This fits particularly well in an executive development program where the participants are highly experienced managers

with a wealth of analytical acumen to share. The most valuable learning comes from sharing with the other participants under the facilitation of a faculty member. This collaboration occurs both in the larger course and within smaller groups and teams. Thus, rather than a focus on concepts, the focus is on the development of applications in a peer-to-peer, e-learning environment in which the participant's co-dependencies foster the motivation to contribute at a high level.

TEACHING SOFT MANAGEMENT SKILLS ONLINE

Henninger and Weingandt's chapter describes an approach to teaching soft skills, such as interpersonal communication skills through electronic media. Rather than dismissing the concept of teaching soft skills out of hand, they ask, "What aspects of the skill can best be taught using software-supported training." In addition to software, synchronous online human tutors can interact with a learner via chat, audio- or video-conferencing. Audio-visual media allow students to convey non-verbal cues that make learners feel more comfortable and obtain immediate feedback.

Henninger and Weingandt's multimedia learning environment called CaiManOnline (Computer Aided Management Applications Online) provides video sequences to learners who analyze them and compare their analyses with those of experts. Related work includes Kessler (2001) who describes how oral communication skills have been taught at Ohio University online using streaming videos and a variety of other audio and video software and media including PureVoice (Qualcomm CDMA Technologies, 2003).

DESIGNING MOBILE LEARNING FOR THE WIRELESS WORLD

Lundin and Nulden's chapter describes the new possibilities of wireless communication to train mobile managers using small portable handheld computing devices for ubiquitous computing interfaces, with less dependence on co-location and synchronicity. Advances in mobile computing and related technologies require the development of new methods and activities for mobile learners. Their approach uses problem-based learning, interactive multimedia, experiential learning, and role-playing.

One of the key competencies that mobile managers need to develop is that of managing a wireless technology based mobile workforce. In an information economy of knowledge workers, these are frequently competencies associated with the creation and sharing of knowledge among mobile and distributed colleagues. Thus, learning activities are media

through which mobile workers discuss problems associated with distributed work in a mobile environment. Through the topics in the exercises, learners are brought to analytically focus on ways of improving the practice of mobile work in a context where these issues are part of the structure of the situation. Role plays enable team members in an organization to understand how the mobile aspect of the virtual group affects others by taking on the roles of those with whom they work. Since mobile-based work is new for many people, exercises aimed at making people comfortable with mobile-based work and mobile technology based virtual work groups are important applications.

However, mobile learning is constrained by the technical limitations of current devices. The use of small screens in mobile computing platforms necessitates extensive scrolling to read text. Video exchanges over small handheld mobile devices are not as readily nor reliably accomplished as in the desktop environment. Over the next decade "augmented reality" interfaces, characterized by "smart objects" and "intelligent contexts" providing instant annotations, will reframe management learning and doing (Dede, 2002).

INTEGRATING ERP INTO BUSINESS EDUCATION

As organizations abandon their portfolios of haphazardly grown information technologies and systems and replace them with a single integrated enterprise resource planning (ERP) system, they increasingly seek recruits from university business programs with an understanding of such ERP systems. Reisel and Watson's chapter discusses how universities have established partnerships with ERP vendors that enable them to install ERP software and provide simulations and exercises for students so that they can be better prepared to join businesses with such systems. ERP is used for logistics, customer relationship management, supply chain management, e-Procurement, knowledge management, and human resource management. ERP systems are incompatible with the software of various vendors predominant in different industries and niches. The Copenhagen Business School is the sponsor of an October 2003 meeting focused on the challenges of reconciling incompatible ERP systems (International Federation for Information Processing, 2003).

TECHNOLOGY PLANNING FOR MANAGEMENT EDUCATION

Hamlin, Griffy-Brown, and Goodrich in their chapter present a model of planning technology initiatives to improve the delivery of management

education. Developed at Pepperdine University's Graziadio School of Management, this model is called the SMART planning process. They explain how Pepperdine uses SMART to develop a management education technology planning roadmap. SMART assesses user needs against the current technological infrastructure and alternative new technologies to develop technology initiatives. Beyond internal technology needs, technology planning for management education should reflect the globalized environment (Conway & Zhao, forthcoming). E-learning is working its way into the soul of management education both in universities and in corporations. The role of e-learning is evolving and universities must assess whether information technologies might be deployed in new ways for new purposes. As e-learning moves to center stage, corporate universities are also starting to use information technology in new ways and for new purposes. The role of e-learning in the corporate university is not simply growing, but evolving with new strategies of management education (Douglas, 2003). Faculty and student buy-in to new technologies must be an ongoing concomitant process (Cummings & Buzzard, 2002).

AVOIDING A DYSTOPIAN FUTURE

Our challenge as management educators is to avoid a dystopian future of mindlessly applying new technologies to management learning in ways that subordinate our humanity to machines. However, the prospect of enabling more humane interfaces and less demeaning technologies in coming years should encourage us to participate in the shaping and deployment of educational technology for a better world. Evolving technologies will enable students to access a spectrum of lectures, simulations, and applications. Thus, if properly harnessed, the technologies and management education applications described in our volume should indeed provide superior tools for management education and management learning in the 21st Century.

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CHAPTER 1

EDUCATING MANAGERS, MANAGING EDUCATION Trends and Impacts of Tomorrow's Technologies

Rogier Brussee, Marjan Grootveld, and Ingrid Mulder

INTRODUCTION

In the last couple of years technology-supported learning or e-learning has been put forward as a means to develop and disseminate knowledge within organizations, accessible on demand at any time and in any place. However, it is naïve to think that buying e-learning software is a one-stop wonder. First, like all innovations in technology e-learning must fit both an organization and its employees. Second, trends in information technology (IT) point to an e-learning future which exploits generally available infrastructure rather than learning-specific environments, as will be discussed in this chapter. Introducing or extending e-learning in an organization will be less intrusive, more easily accepted by learners and therefore more successful, provided of course that the technology is embedded in an appropriate training strategy and that good learning material is available.

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Tapping these IT trends will require a new, more outward-looking approach to e-learning. It involves going from a closed model where learners are locked in an encapsulated computer-based training environment to an open model where integration with the rest of the world is a prime concern. More dimensions of effective technology integration into learning and working are elaborated in Spector and Wang (2002). The more outward-looking approach also involves people participating in communities in which they can both learn and work together, and organizations prepared to make learning and knowledge acquisition part of their daily work and regular infrastructure. This holds for all types of learning, but it is particularly true for e-learning. One of its prime attractions is "anytime anywhere": the promise that e-learning can be done whenever and wherever it is most convenient to the learners, integrated with the rest of their lives. Because of the growing lack of time caused by economic pressure and the ambition of people to "live several lives," we believe there will be an increasing demand for a mixture of learning, working, and relaxation. Integration with the rest of the world acknowledges that learners, in particular adults in a corporate setting, have many things to do and many ways to learn things apart from e-learning.

LEARNING TO MANAGE INNOVATION

Innovation in new technologies starts with the people in organizations (Agostini et al., 2000; Mulder & Swaak, 2003). In other words, the people that are supposed to use tomorrow's technology and the needs of the organizations in which they are going to use it, should lead to the key requirements for designing new technologies. This is hardly a novel idea, but one that is easily forgotten. Managing technological innovation is hard to do without a basic understanding of the technological issues. This is difficult, as technology often revolves around a myriad of technical details, which together make the difference between possibility and impossibility. Nevertheless, at the interface between the goals of an organization, its people and its technology, management decisions are key to success.

Having said this, to put this idea into practice in the actual introduction of new technologies is easier said than done. Since it requires the threefold understanding of the people involved, the organization, and the chances and risks of new technologies, balanced choices will usually need the input of different people with different expertise as well as a willingness of all parties involved to be sensitive to the "big picture." Managing the process, in particular bringing together the people involved and constantly assessing the overall goals, is very important.

The impact of an innovation on an organization depends among other things on the area where it takes place: are core activities affected, or are

the changes restricted to more peripheral parts of the business? Innovations of the former type are probably more disruptive to the day-to-day process than those of the latter type, but the boundaries may be blurred. Consider employee learning, for instance. Even in many organizations where knowledge and skills are not among the key products or services, employee learning and skill management are seen as more important than in earlier days. This means that learning, although no core activity, influences the work process of many if not all employees. Therefore changes in a company's learning process will probably affect them all.

Introducing electronic learning (e-learning) in an organization is an interesting example of an innovatory process. The hype factor in the field is large and the technology and infrastructure needed are usually considered complex. For example, there is a huge number of e-learning platforms with varying functionality (for lists of e-learning platforms, tools, and vendors visit e.g., Brandon-Hall (2003) and the e-Learning Centre (2003)). Second, it follows from the tendency to overestimate technology in the triplet people—organization—technology. Thus a discussion on e-learning is often reduced to the question which e-learning platform is needed. More fundamental questions, like what the basic training needs of employees are, to what degree trainees' activities have to be monitored, and how e-learning integrates in the organization, are indeed more difficult to answer. Yet it is crucial that such questions are at least partially answered before large investments in money, effort, and goodwill are made.

Usually, the introduction of e-learning is intended to supplement traditional face-to-face learning; in other cases e-learning should replace it. In any case, however, the ideal innovation should fit in with an employee's daily work and disturb the business process as little as possible. In the remainder of this chapter we describe four IT trends that support learning characteristics, yielding a complex of crucial functionalities that would make e-learning in a corporate setting less intrusive than it currently is.

PEOPLE AND THEIR LEARNING PROCESS

In learning and teaching—digitally or not—the goal is to transfer knowledge and skills from people to people and to benefit from other people's experience in solving problems. Research shows that up to 70% of job-related learning is informal, driven by an individual, that is, not acquired from a trainer in a scheduled class but for instance from a colleague during coffee break or by surfing the Web (Center for Workforce Development, 1998). Informal learning is supported by a working climate that stimulates collaboration and the exchange of knowledge. This does not necessarily imply extended coffee breaks, but rather management support for sharing information across hierarchical and departmental, per-

haps even company boundaries. In other words, learning benefits from a social environment in which people can easily find experts to answer their question or assume the expert role themselves. The importance of communication in transferring knowledge can hardly be overestimated.

A risky aspect of informal learning is the possibility that people transfer incorrect information or draw incorrect conclusions from what they hear or read. In conventional formal learning, where a teacher steers the learning process, this risk is smaller. Moreover, the combination of a teacher with a well drawn up curriculum and appropriate learning material is usually a guarantee that the information offered is neither too simple nor too difficult, a danger that is always imminent when information is presented in a passive manner, for instance on a municipal website. Whereas formal learning is shaped by—partly unconscious—preferences of an individual learner, the power of informal learning lies in the systematic design and—one would expect—alignment with organizational goals. Most learning methods lie between these extremes (Center for Workforce Development, 1998).

The above holds for learning in general. Now let us look at technology-supported learning. The hype around electronic learning is not surprising considering, first, the increasing regard for human capital and employability, second, a company's permanent need for keeping employees' knowledge and skills up to date and third, technological developments. We assume that digital courses are what most people associate e-learning with. In the ideal online course advantages of formal and informal learning converge. Imagine a flexible arrangement of well designed learning units that are up to date, fit an individual employee's experience level, allow a more superficial or a more thorough approach—depending on the available time as well as the learner's goals and background—and provide feedback to the employee and possibly to the Human Resource Development department. In addition to online courses, the notion of e-learning may extend to providing communication tools and a social setting like a virtual classroom for peer support as well as functionalities for competency management and for arranging planning, learner tracking and certification. In this chapter we assume the following definition: e-learning is the use of information technology in order to

1. create, manage, select, use, and disclose learning material,
2. facilitate working together and communication in a social environment and
3. create, store, and manage data on students so as to track and monitor progress of study results (i.e., to monitor the learning process).

For examples and details see Van Vliet & Grootveld (2002).

Next to this range of e-learning functionalities there are various reasons why organizations choose to introduce e-learning. E-learning can for

instance simulate processes that are difficult to explain or rehearse in a normal classroom, for example in safety training. An electronic course can start any moment; there is no need to get together a minimum number of participants, although interaction with other participants might improve the knowledge transfer. However, those other participants may be scattered around the organization or even around the globe. Next, the existence of repositories with well-labelled educational material of different granularity—ranging from single pictures to complete lessons—enables learners to actively select and construct their own learning path. In such a constructivistic learning paradigm (see Bannan-Ritland et al., 2001; Duffy & Cunningham, 1996) a teacher's role would shift towards coach or learning facilitator. Finally, the choice for e-learning is often motivated by considerations of cost and convenience. When many people participate it may translate in lower training costs, but can also mean that—at constant costs—training becomes more extensive and deeper.

In the light of such diverse functionalities and advantages it is impossible to predict return on investment in general. Other factors to consider are the number of people to be trained and the character of the organization. Large international enterprises such as Ernst and Young, Procter and Gamble, Cisco, and Deutsche Bank provide courses online. They have the advantage of having large groups of employees that need relatively uniform skills. Thus when these companies succeed in putting at least part of their internal skills development in an e-learning format, they can spread the high initial investments over a large group, which rapidly leads to returns on investment. However, most small and medium-sized enterprises lack these scale advantages, which makes it a challenge to introduce e-learning here. Moreover, even the largest companies often have lots of smaller groups for which e-learning is currently not an option if group size is the only criterion.

The good news is that technological trends exist that should make e-learning viable for a much larger audience in the near future; in fact, large parts are already in place. The next section introduces four of these trends. Thereafter we describe how these trends relate to the learning process in the social environment of a corporate setting.

GENERAL TRENDS IN INFORMATION TECHNOLOGY

E-learning is a technologically demanding area and, perhaps unfortunately, many issues are overshadowed by technological boundary conditions. Therefore it is relevant to understand some of the technological background and the technology push in this area. We see four general IT trends that are particularly pronounced in e-learning and that are in part shaping the development in this area:

- *communication*, the use of communication networks to get access to people and information,
- *integration*, the trend to be able to combine various components of different vendors in one system,
- *personalization*, the trend to make computer systems more "aware" of the person using it and the context he or she is in,
- *commodization*, the change to generic technologies developed for reasons other than learning.

We first explain these trends and then describe how they influence e-learning.

Communication

Communication with people is clearly a basic need in businesses and society at large. Postal service and telephone have long found their place in society, but using computers for communication is a relatively recent phenomenon. It requires computer networks which only began to get serious penetration as late as the early nineteen nineties (Gray, 1996). Unlike the telephone networks, computer networks were built primarily as a means to interchange data between computers. However, this enables other forms of communication over these networks. We distinguish three forms of communication:

- synchronous, i.e., real time communication between people, ranging from Internet chatting to videoconferencing,
- asynchronous communication between people, like the use of e-mail, mailing lists, and discussion forums,
- data communication proper, like the use of the World Wide Web or intranets as well as centralized file servers and client-server applications.

Data communication allows easy widespread distribution of information. This in turn allows management of the information by the most interested parties. This can both mean centralization for easier control and management and decentralization for separation of concerns. The best known example of this model is the omnipresent world wide web, but it can also be seen in the intranets of corporations.

Integration

Software is expensive to produce. It is often easier and thus cheaper to produce a useful application starting from several smaller reusable components than from scratch. This is slightly more complicated than it sounds,

because it means that these components have to exchange information. Thus the different components have to agree on what this information means, which is more difficult if those components are developed by or are under the control of different parties. However, communication using open, widely used and understood standards has become possible and the point has now been reached where components distributed over the web can provide the appearance of a single application. We can already see this integration idea at work in the web. One of the things that make the web so attractive is that pictures, text, and video, often stored on different computers, can be combined to a single web site, thanks to the universal use of standards like HTML, the URL, and http.

Personalization

Personalization is the trend to make software more aware of the preferences, background, and context of the person using it. Personalization is impossible if the system has no knowledge of the user. Thus there is a corresponding trend to create user profiles with information varying from the preferred color scheme of his desktop, to his buying behavior, his education, and his current location. Personalization holds a great potential for making computers more useful and user friendly. At the same time there are privacy issues which seem poorly understood, are politically sensitive and which in the longer run could have significant effects on the functioning of society and the way we do business (compare Bresnahan, 2000; SIIA, 2003; Smith, 2000).

Commodization

Commodization is the use of generic, widely available technologies and open standards instead of specialized and often proprietary solutions (Consult Management Group, 2003). Commodity software is generally easier to integrate with other software, often cheaper because its costs are spread over a larger number of applications, and often better because of greater competition. Commodity technologies are like the containerships that criss-cross the world. Rather than using special ships to transport wine, toys, and car parts, containerships carry all of those products. Transport using a container is fast and cheap because economies of scale allow fast containerships to be built and containers can quickly be loaded on trucks and train cars. This is only possible because of the standardization of the container.

Commodity information technology, in particular widely used standards and the infrastructure that implements these standards, is especially important in networked environments. In such an environment it is often

more important to be able to communicate with other parties than that the system is tailored to specific needs of any single party.

INFLUENCES ON THE DEVELOPMENT OF E-LEARNING

Since e-learning is so technology intensive, the technological trends we mentioned have a strong effect on e-learning itself and the way it is used and organized. We consider these influences on three separate areas that we already identified as the three core processes covered by e-learning platforms. In each of these areas, the technology trends seem to drive e-learning in the direction of more sophisticated infrastructure, which is closer to common usage of the learner in the organization, however.

Offering Online Courses

Offering learning material or educational content is what is often thought of as e-learning proper. Indeed it is an important aspect. There are several desiderata for digital educational content (see (Canning-Wilson, 2000; MHEC, 1997)). Here we can only touch on the way the content is created, managed, and delivered. Content and content management are areas where the commodization trend can be distinguished very clearly. Until the late nineties, e-learning content was mostly produced for closed environments using proprietary standards and techniques. This was natural because such content often required relatively complex supporting infrastructure. An integrated, ready to run CD-ROM containing everything needed to consume a course was—and often still is—a reasonable approach. The web infrastructure has changed this, at least where bandwidth is available. Web browsers and web standards like HTML and XML have become resources that simply can no longer be ignored. Since they are widely used, other, proprietary solutions for rendering rich text, pictures, video, or animations have become a management burden on the users. As a result, customers have started to demand web-based content because they found the learning curve for using the entire system drastically reduced. Moreover, serving content from a central server makes the content easier to control and to update, as well as posing a smaller security risk (Rosenberg, 2001). Fortunately, the tools available for producing high quality web content also made it easier and cheaper to produce high quality educational content, and sophisticated web content management systems are a booming industry.

The above description is a slight oversimplification, however. Educational material is expensive to create, benefits from good descriptions of its content and has to interact with the user and administrative systems that keep track of results and learning goals. All but the simplest learning mate-

rial benefits from being personalized by adapting to the expertise level of the learner. Also it often requires learners to do some tests which influence the path learners take through the material. While none of these characteristics are unique to e-learning, the level of sophistication that can be used fruitfully is comparatively high. For this purpose, e-learning-specific technology on top of the web infrastructure has been developed.

The currently popular approach to handling these problems is to split learning material in small independent reusable learning objects. In principle, a learning object is a didactic rather than a technical unit. It is meant to be the smallest unit that can be independently taught and learned and can therefore be reused (see e.g. (Barritt and Lewis, 2000; Rosenberg, 2002: 170; Wiley, 2002)). In the supporting technology, a learning content object is a small reusable piece of material with a web interface. Learning objects have a separate description of the content—the so called "metadata"—and of the way these objects are to be combined into "chapters" and "sections" to make out a larger unit, e.g. a full course. Moreover, the use of each object by each individual learner can be tracked and conversely the object can interact with the system to discover the characteristics of the learner. The system can track whether the learning content object is visited and, if the object contains a quiz, what the result of the quiz is. The results of this quiz and previous quizzes and other data can then be used to determine if additional learning units are necessary.

This approach is a typical example of the commodization, personalization and integration trends applied to learning material. *Commodization*, because it shifts the bulk of the technical infrastructure to the web, *personalization*, because the selection and the behavior of the learning units is supposed to depend on the context of individual learners, and *integration*, because the hope is that learning material can be created by combining objects from different suppliers or combining existing objects with new ones. For example, the GMAT CAT test (Graduate Management Admission Test, computer adaptive test) is designed to present exercises depending on the difficulty of previously correctly answered questions (GMAT, 2003). A preparation course for the GMAT might contain a learning object with this adaptive test, learning units from a statistics course for the social sciences as well as more business-oriented learning objects. The currently most widespread model of this idea is SCORM, the Sharable Content Object Reference Model from the Advanced Distributed Learning initiative launched by the US army (ADL, 2003; Robson, 2001). The SCORM specification integrates a set of existing open specifications from educational standardization bodies like AICC and IMS (AICC, 2003; IMS, 2003) and relies on existing web infrastructure. It has received broad support from both content and e-learning platform vendors even though the specification is still in flux.

Even though the commodization trend has influenced the design of SCORM, it is possible that the specification may fall prey to the com-

modization forces itself. Many of its core components are hardly e-learning-specific. For example, the specification for packaging and organizing the learning objects together (IMS Content Packaging) is very similar to what is used in the software industry for creating software packages. Moreover, some of the functionality has been designed with learning platforms to organize and administrate the learning process in mind. It is possible that specifications and infrastructure will come up "in the world at large" that provide enough of the SCORM and learning platform functionality to let both slowly fall into disuse. It is also not clear whether the extensive learning unit machinery is always worth the effort. Simply making web pages or Powerpoint™ slides available may be a less formal but more effective way to reach a training goal.

Counter to technological forces, there is some doubt about whether the strict independence of the learning objects that is needed to effectively repurpose them, is a viable didactic model (Welsch, 2003). It is hard to imagine how a didactically appropriate sequence of objects can come about if these objects don't "know" about each other. Another serious possible roadblock to the use of learning objects is the way publishers and educational institutions will handle them. Finding well-described content objects on the web and seamlessly integrating and combining them would make life easier for many people. However, learning objects also pose a real rights management nightmare. People will want to modify them and use the pictures in their presentation. Will publishers sell a license for the use of a few objects in a larger derived work in the sense of copyright law, reuse only in house, or will they prefer a model where each access by a learner is accompanied by a small electronic payment? The situation is similar to that in the publishing, entertainment and software industry and it seems likely that in the future all the models will be used simultaneously. However, education is special in the sense that schools and especially universities have a history of sharing their publications and learning material. The prestige gained by publication might be enough impetus to share in academic circles. Indeed, such "open source" e-learning content is already coming out of institutions like the Massachusetts Institute of Technology (see the MIT Open CourseWare project (OCW, 2003) and the companion Open Knowledge Initiative (OKI, 2003) to provide the underlying learning platform).

Creating a Social Environment

The social environment, in which learning takes place, is usually a motivational aspect of the learning experience; especially when this environment is created through the interaction of the learners themselves. The communication trend is important to build up this social environment for

e-learning; new technologies make communication easier and create more and new possibilities for working and learning together. For example, on the high end of the spectrum, videoconferencing is slowly becoming easier and more affordable as high-speed Internet access is becoming available and software is improving. Within organizations that have set things up appropriately—a non-trivial exercise—it can be a valuable tool. For instance, videoconferencing can give extra opportunities to "visit" congresses and lectures. Although in a conference the experience of physical presence and the opportunity of meeting the other attendants face-to-face is often at least as important as the lectures themselves, it may be worthwhile to attend virtually when physical travel would have been prohibitively expensive or time consuming. Of course, not all communication needs to be technology-mediated, though introducing new communication technologies can leverage the social environment (Verwijs et al., 2002).

However, changing the communication channel will change the communication itself. Empirical studies showed that learners behaved differently when attending classes through a videoconferencing system: confronted with a situation even more formalized than regular classes, they had little interaction with each other and were more reluctant to ask questions (Malpani & Rowe, 1997). The idea that videoconferencing could recreate the classroom just turned out be somewhat naïve. Conscious choices have to be made of the proper means of communication, taking into account what people have experience with and how communication tools interact with basic human behavior like fear of losing face. In addition, one should pay attention to practical matters such as bandwidth, firewalls, cost and the maintainability of the required software.

Videoconferencing is only the most advanced example of a synchronous (real time) communication channel. Other possibilities like chat or the venerable telephone will often serve just as well. Not all communication need or even should be synchronous however. Starting a news group has regularly and successfully been used to set up learning communities in which people share experiences and help each other, and they are used by mentors to communicate to their learners. Such mailing lists are relatively low-tech solutions with low bandwidth requirements and can be quite successful. For example, the Open University at Hagen (Germany) starts courses at regular intervals, in part so as to have a large enough group that can exchange experiences (Kaderali, 2001). Such groups are not always easy to set up and run. Apart from serious technical trouble in setting up real time online sessions, the lack of personal acquaintance will often shy away people.

Apart from the communication trend, the integration and the commodization trend also seem to influence the way the social environment is created. E-learning has traditionally been a forerunner in the use of communication techniques which has lead to build communication facilities in e-learning systems. However, communication clearly has its use outside of

education. As e-mail, portals on intranets, messenger services and groupware extensions to common office tools become commonplace, there will probably be less need for special tools made for the educational market. For example, schools find that the messenger services in learning platforms are not used because pupils have long found their way to a commercial messenger service, noting that it works better and allows them to chat with *all* their friends and not just in their class. This illustrates the importance of paying attention to people's experiences with means of communication.

Organizing the Learning Process

Training people is a process that requires planning and tracking of results. If hundreds or thousands of employees are involved, tracking their many different competencies, learning goals and certificates is a resource management problem not unlike tracking the need for and the availability of cars in a corporate car fleet. Likewise, planning training will require allocation of trainers, classrooms, course days, e-learning material, and not to forget trainees which will typically have other tasks that interfere with training. Of course, skills and competencies are much more subtle and more difficult to describe than the number and type of cars a company owns. However, once reduced to the question when an employee can absolve a certain training to get a certificate, or which manager needs to authorize a course, the allocation problem and the result tracking becomes quite similar.

The desire to track and manage competencies of individual employees is what gives rise to competency management. Conversely, because of the use of these management systems, very fine-grained employee profiles become possible, in the case of online learning, even to the point of tracking how individual learning units where absolved. This is an example of the personalization trend at work and in particular the resulting trend to set up detailed user profiles. The individual competency profiles are used for management decisions, but they are also used by the system to suggest how to meet the individual educational needs of employees. Learning content may even be dynamically adapted based on such fine-grained data.

Some commercial e-learning systems, like those of Saba and Docent, de facto have their main functionality in planning and competency management (Saba, 2003). Conversely, the desire of organizations to integrate planning and competency data with Human Resource Management (HRM) and Electronic Resource Planning (ERP) systems, has created competition from vendors like PeopleSoft and SAP (PeopleSoft, 2003; SAP, 2003). We consider this an example of the commodization trend: even though ERP systems are highly specialized and proprietary, resource plan-

ning is still more generic and more widely spread than the particular planning and tracking needed for training. Likewise, HRD is also much more widespread. Companies like PeopleSoft and SAP have launched products that can be used for planning and to track competency and certification. They also started to add online course facilities that blur the distinction even further.

IN CONCLUSION

Innovations in new technologies both affect and are affected by the people involved in the organization where the changes take place. To increase the chances of a smooth and successful innovation, it is important for an organization to seek commitment from its employees. For example, when innovating the learning process, technology itself is not sufficient to drive interest in, acceptance of or satisfaction with e-learning (ASTD, 2001). One way to achieve commitment, is to let technology imitate essential parts of the earlier process. For instance, technological innovations in learning can and preferably should support communication between learners and help create a social climate that stimulates knowledge exchange.

TABLE 1
E-learning Aspects Versus IT Trends

Aspect vs. Trend	*Communication*	*Integration*	*Personalization*	*Commodization*
Offering online courses	Data communication through distribution over the World Wide Web	Combining content from different suppliers	Content adapted to individual learners	Standard infrastructure (e.g. web) and content management
Creating a social environment	New means of Communication	Integration of communication tools in learning environments		Use of standard communication facilities
Organizing the learning process		Tracking of content use, learner results, competency management, external information	Fine-grained personal competency profiles	Using ERP and HRM systems for e-learning

We believe that learning in general and e-learning in particular will be most successful if it fits in with people's daily work and recreation, if it adapts to people's learning goals rather than defining them and if it uses widely available infrastructure rather than specialized environments.

In this chapter four trends in information technology—communication, integration, personalization, and commodization—have been related to three major aspects of e-learning: to offer learning material, provide a virtual social environment, and organize the learning process (see Table 1).

Especially commodization, i.e., the increasing use of generic technologies developed for reasons other than learning, is likely to have a serious impact on the development of e-learning. It seems that the "e-" in e-learning will become less visible than it is nowadays and that e-learning will evolve towards informal learning. We believe that, in order to make the innovation successful, the challenge is to redirect the efforts towards more fundamental didactic, organizational, and economic issues.

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CHAPTER 2

LEARNING AND TEACHING MANAGEMENT ON THE WEB What Do We Know?

J. B. Arbaugh and Leigh Stelzer

INTRODUCTION

The acceptance of computer mediated instruction and Web-based courses as a viable educational delivery medium greatly accelerated during the late 1990s. There was a thirty-three percent increase in the number of universities providing distance education from 1998-2001 (Alavi & Leidner, 2001) and it is predicted that up to eighty percent of all colleges and universities will be offering some form of Web-based education by 2003 (Steinberg & Wyatt, 2000). In January 2003, the online version of Business Week provided profiles of sixty Web-based MBA programs.

The rush to the Web has led some to question if we fully understand the implications for courses, students, instructors, or educational administration (Grossman, 1999; Shedletsky & Aitken, 2001). These concerns mirror earlier criticisms of research on distance learning, noting too much focus on single courses and limited measures of student outcomes—learning, examination performance, participation, and communication (Phipps &

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Merisotis, 1999; Worley, 2000). A dramatic increase in research, however, is providing more answers to more questions about the use and value of the Web for business education.

This chapter highlights the major variables that make a difference in the success or failure of courses using the Web and identifies directions for future research. The chapter is divided into five major sections. First, we examine factors that can affect performance in online vs. face-to-face education and discuss the emergence of hybrid courses that are delivered in some combination of these modes. Second, we review course structural characteristics such as class size, class locations, and subject matter to see if these influence the success of Web courses. Third, we examine the effects of instructor characteristics and behaviors—experience, choice of pedagogy, and quality of interaction—that have been associated with Web course quality. Fourth we examine student characteristics—computing experience and anxiety, gender, race, ethnicity, age, and learning style—that have been associated with student learning via computer and the Web. The chapter concludes with a summary of the current state of knowledge about Web courses for management education and makes suggestions for future research.

WEB VS. CLASSROOM, OR BOTH

One of the most abundant streams of research on teaching via the Internet has been the comparison of Web-based and/or Web-enhanced courses to similar courses conducted in a face-to-face classroom format. Nearly all these studies conclude that in terms of perceived learning or examination performance, students in courses delivered whole or in part via the Web perform as well or better than students in classroom courses (Saba, 2000). Several studies found no significant difference in student learning and/or course satisfaction (Arbaugh, 2000b; Arvan, Ory, Bullock, Burnaska, & Hanson, 1998; Borthick & Jones, 2000; Card, 2000; Dellana, Collins, & West, 2000; Freeman & Capper, 1999; Hiltz, 1994; Piccoli, Ahmad, & Ives, 2001; Thirunarayanan & Perez-Prado, 2001; Warkentin, Sayeed, & Hightower, 1997) while some studies have found significantly higher scores (Andriole, 1997; Dumont, 1996; Foley & Schuck, 1998; Redding & Rotzien, 2001; Ricketts, Wolfe, Norvelle, & Carpenter, 2000; Shapley, 2000) in student learning in Web-based courses.

The few studies that report lower student performance in Web-based courses may reflect characteristics of the studies rather than the delivery medium. Chizmar and Walbert (1999) and Collins (2000) examined undergraduate economics and biology courses respectively during 1997, prior to the significant adoption of now ubiquitous standardized course delivery software packages. Follow-up studies (Moskal & Dzuiban, 2001) found that

Web-based courses receive higher student evaluation ratings than their classroom-based counterparts. Additional studies have found dissatisfaction, but no diminution in performance (Cohen, 2001; Davis & Ralph, 2001; Hara & Kling, 2000; Kamin, Glicken, Hall, Quarentillo, & Merenstein, 2001). Thus, from a student learning perspective, Web-based learning appears to be a viable complement or alternative to the traditional classroom. An emerging trend in this research is the increasing use of hybrid course formats that combine features of both web-based and classroom courses (Alavi & Leidner, 2001). Initial comparative studies show hybrid formats compare favorably to straight online and classroom modes (Benbunan-Fich & Hiltz, 2002; Hartman, Dzuiban, & Moskal, 2000).

Comparisons of student participation, peer-to-peer interaction, and student-faculty communication show mixed results, likely influenced by variations in student and faculty experience with Web-based courses, and technical factors such as adequate bandwidth, access, and support (Arbaugh, 2002b; Mariola & Manley, 2002; Palloff & Pratt, 2001; Shea, Motiwalla, & Lewis, 2001). While participation in class discussions has been shown to be greater (Arbaugh, 2000b; Benbunan-Fich, Hiltz, & Turoff, 2001), more evenly distributed (Card, 2000; Strauss, 1996), a source of stronger bonding (Whipp & Schweizer, 2000) and more liberating for women (Wolfe, 2000) in Web-based course activities, this interaction can be both significantly more difficult (Arbaugh, 2000b; Hightower & Sayeed, 1996; Yoo, Kanawattanachai, & Citurs, 2002) and less satisfying (Ocker & Yaverbaum, 1999; Piccoli, Ahmad, & Ives, 2001; Warkentin *et al.*, 1997). Access to and interaction with the instructor appears to be equal or greater in Web courses (Arbaugh, 2000b; Carswell, Thomas, Petre, Price, & Richards, 2000; Hiltz, 1994; Hiltz & Wellman, 1997; Hislop, 1999).

Comparisons of synchronous and asynchronous communication in online course formats are almost non-existent (Alavi & Leidner, 2001). One study of management educators showed little interest in the synchronous communication capabilities of the Web (Stelzer, Yin, & Collins, 2002). This may reflect limits on the technology current in academia. Educators may feel synchronous communication compromises the convenience and/or flexibility of asynchronous formats (Arbaugh, 2000a; Arbaugh & Duray 2002; Hislop, 1999; Shapley, 2000) or synchronous communication may be too difficult or time consuming to manage with the technology available.

Similarly, comparisons of course delivery platforms have received scant attention from academic researchers. While courses with a variety of course software packages—The Virtual Classroom, TopClass, E-Education, LearningSpace, WebCT, and Blackboard—have been studied, head-to-head comparisons of their effect on learning are lacking. Comparisons get mentioned only in multi-semester or multi-institution studies (Arbaugh & Duray, 2001; Arbaugh, 2002a). Surely the assumption that dif-

ferent technologies, procedures, and looks and feels are comparable requires critical examination in future research.

Based on this review, there appears to be sufficient comparative research of the impact of Web delivery and enhancements on student performance to conclude that it is at worst neutral, and at best offers significant educational benefits. That said, the greatest gains from future research will likely come from studies of how various instructor characteristics and behaviors interact with the Web (Alavi & Leidner, 2001; Arbaugh & Duray, 2001; Hiltz, 1993), institutional characteristics (Bradley and Russell, 1997; Fornaciari, Forte, & Matthews, 1999; Sorg, Truman-Davis, Dzuiban, Moskal, Hartman, & Juge, 1999) student characteristics and behaviors (Arbaugh, 2002b; Hiltz, 1993; Larson, 2002), and/or pedagogic strategies (Worley, 2000; Campbell, 1997; Dumont, 1996; Sankaran & Bui, 2001).

COURSE STRUCTURAL CHARACTERISTICS OF EFFECTIVE ONLINE LEARNING

What makes a Web course attractive, satisfying and a good learning experience? Convenience and flexibility—anytime, anywhere—are acclaimed as the distinctive and most valuable contributions of online courses (Arbaugh & Duray, 2002; Fornaciari *et al.*, 1999; Hiltz & Wellman, 1997; Hislop, 1999; Kinney, 2001; Shapley, 2000, Sullivan, 2001). Recent empirical work, however, finds the flexibility inherent in Web-based courses ceases over time to remain a significant predictor of student learning and satisfaction (Arbaugh, 2002a). Flexibility may be a "novelty effect." Once that novelty wears off, students expect a quality learning experience regardless of convenience (DiBiase, 2000a; Gibson & Gibson, 1995). A variety of structural characteristics—student dispersion, class size, subject, and instructional media—comprise a quality learning experience.

Student Dispersion: Multi-Class, Multi-State and Multi-National Course Environments

The opportunity to address dispersed student populations is an important element of the convenience of Web-based courses. A number of studies incorporate multi-location classrooms (Alavi, Yoo, & Vogel, 1997; Jarvenpaa & Leidner, 1999; Yoo *et al.*, 2002), and multi-institutional arrangements as well as cross-national course delivery using the Web (Hayes & Mayercik, 2001; Kłobas & Haddow, 2000; Lawther & Walker, 2001; Vogel, van Genuchten, Lou, Verveen, van Eekout, & Adams, 2001).

This flexibility has been invaluable to internationalizing business and management education. Further, these studies have the potential to isolate explanatory variables.

While most multi-setting studies are small scale, usually involving two institutions and a few courses, they have yielded valuable insights. These include the Web's usefulness in cross-cultural settings (Yoo *et al.*, 2002), the importance of interaction and instructor experience, the perceived flexibility of the medium in predicting course effectiveness (Arbaugh & Duray, 2001; 2002; Hiltz, 1993; Sullivan, 2001), and the applicability of collaborative learning to international settings (Oliver & Omari, 2001).

Overall, these studies suggest that geographical dispersion alone is not a hindrance to the effectiveness of Web-based courses. Nevertheless, faculty need to be cognizant of the particular characteristics of the dispersed population. In reviewing a Web-based course offered to both native Australians and international Singaporean students, Lawther and Walker (2001) noted that despite Singapore's high-tech claims many of the students "did not access the Internet but simply had friends download files and then pass around the hardcopy notes to classmates."

Class Section Size

The Web is a useful supplement to relatively large classroom-based courses, but large enrollments in Web-based courses may reduce their effectiveness. Thoennessen, Kashy, Tsai, and Davis (1999) found that using an asynchronous supplement to classroom-based courses of over 400 students increased student performance by ten percent when compared to similar courses that didn't use the supplement. Hiltz and Wellman (1997) found it difficult to help students get a personal feeling for each other and that student rebellions were not uncommon in class sections as small as 96 students. Using a sample of courses with enrollments of up to 50 students, Arbaugh and Duray (2001, 2002) found class section size negatively associated with student learning. Other studies with class sizes of thirty or fewer, however, found class size was not a significant predictor of student learning or satisfaction (Arbaugh, 2001; 2002a; 2002b). Thus, while smaller student enrollments may not increase learning, larger enrollments may well compromise the learning experience. In an earlier study of online courses, Andriole (1997) proposed maximum instructor/course quality ratios: 1 instructor for every 30 students, 1 instructor + 1 assistant for every 50 students, 1 instructor + 2 assistants for every 75 students, and so on. However, subsequent research has not examined these types of course structural arrangements.

Subject Matter/Characteristics of Topics

Seemingly, no academic discipline is immune from Web-based innovation and research on "Webization" of traditional courses has become a cottage industry. The majority of discipline-based research on Web courses appears to be in Information Systems (IS). This, no doubt, reflects the pioneering course development work in IS done by Roxanne Hiltz, Murray Turoff, and colleagues at the New Jersey Institute of Technology (Benbunan-Fich & Hiltz, 1999; Hiltz, 1993; 1994; Hiltz, Johnson, & Turoff, 1986; Hiltz & Turoff, 1993; 2002; Turoff & Hiltz, 2000), and this discipline's interest in topics such as technology adoption (Benbunan-Fich & Stelzer, 2002; Davis, 1989), computer-mediated communication (Chidambaram, 1996; Hiltz *et al.*, 1986; Jarvenpaa & Leidner, 1999), and decision support systems (Leidner & Fuller, 1997).

Research on Web-based IS courses suggests that students perform as well or better than in a formal classroom (Andriole, 1997; Alavi *et al.*, 1997; Hiltz *et al.*, 2000; Sankaran & Bui, 2001; Turoff & Hiltz, 2000), and that courses promote the acquisition of technical procedural knowledge (Leidner & Jarvenpaa, 1993; Piccoli *et al.*, 2001), encourage collaborative learning (Alavi, 1994; Borthick & Jones, 2000; Shen, Hiltz, Cheng, Cho, & Bieber, 2001), and increase student access to instructors and student-instructor interaction (Carswell *et al.*, 2000; Hislop, 1999).

Recent research on Web-based courses include studies in other business and management fields: accounting (Marcheggiani, Davis & Sander, 1999), finance (Basile & D'Aquila, 2002; Mariola & Manley, 2002), management science (Dellana *et al.*, 2002; Warkentin *et al.*, 1997), and management (Alavi, Wheeler, & Valacich, 1995; Alavi et al, 1997). Additionally, business management educators increasingly view Web-based instruction as value-added: enhancing student critical thinking skills (Stelzer, Yin & Collins, 2002; 2003), developing team building skills (Klobas & Haddow, 2000), and improving graduate management education (AACSB International, 2002). McEwen (1993) identifies increased critical thinking skills as a desired outcome of adopting the electronic dialog. More recently the AACSB Task Force (2002) envisions a variety of Web-based innovations to reduce the costs of providing graduate management education and improve the product by incorporating the Web into the curriculum.

Additional studies of Web-based instruction come from the disciplines of education (Cohen, 2001; Swan, 2002; Thirunarayanan & Perez-Prado, 2001), the sciences (Owens & Waxman, 1998), psychology (Wang, Newlin, & Tucker, 2001), communication (Davis & Ralph, 2001; Wolfe, 2000), foreign language (Alvarez-Torres, 2001), nursing (Brudenell & Carpenter, 1990), medical studies (Kamin *et al.*, 2001), math (Kinney, 2001), geography (DiBiase, 2000b), library science (Sierpe, 2001), and social work (Johnson & Huff, 2000; Schoech, 2000).

Most studies of Web-based course delivery focus on a single course, anecdotal experiences or comparisons with classroom-based courses. However, some business education research is broadening beyond these initial boundaries (Arbaugh, 2000a; 2000c; Arbaugh & Duray, 2002: Borthick & Jones, 2000; Coppola, Hiltz, & Rotter, 2002, Salmon, 2000). Comparisons of business disciplines such as management, accounting, marketing, and finance are limited, but initial work in this area suggests that factors such as technology, course structure, and instructor-specific behaviors may be more predictive than characteristics of any particular sub-discipline or content area (Arbaugh, 2000a; Arbaugh & Duray, 2002).

Instructional Media/Class Assignments

Historically, Web-based courses have relied extensively on text-based transmission of course content and discussion. This is true for a number of reasons, such as limited bandwidth, concerns over minimum hardware/software requirements for students, and the learning curve required for both students and instructors. As a result, there is little research that examines the effects of various types of media on course outcomes. Arbaugh (2002b) found that the use of varying numbers of audio and/or video clips in a study of thirteen Web-based courses was not a significant predictor of student learning or course satisfaction.

With the rapid advances in computing hardware and system bandwidth of the past few years, it is becoming much easier to create a multimedia environment for online learning (Hayes & Mayercik, 2001). However, the addition of this media will not come without cost, with the time required by faculty and instructional designers to develop such material being a significant source of those costs (Dumont, 1996; Liaw, 2001; Shedletsky & Aitken, 2001). These advances in hardware and software and the implications of this cost-benefit ratio suggest a fluid environment for future research.

INSTRUCTOR CHARACTERISTICS

The Web's *deus ex machina* nature belies the importance of the instructor for Web-based instruction. There is more to delivering Web-based courses than building a series of Web pages and handing them off to students. The real value-added lies not in the posted course materials but in how the instructor manages what takes place in the "classroom" in response to the material. This is why Arbaugh and Duray (2001) found that prior instructor experience was positively associated with student learning and course satisfaction. Individual instructors make the difference in their choice and implementation of pedagogy, the learning environment that they encourage, and the quality of their interaction with students.

Pedagogical Choices: Objectivist Vs. Constructivist

A prominent discussion in the application of educational theory to courses on the Web centers on the choice of objectivist and constructivist approaches to learning (Benbunan-Fich, 2002; Leidner & Jarvenpaa, 1995; Markel, 1999; Packer & Goicoechea, 2000; Roblyer, 1996; Rossner-Merrill, Parker, Mamchur, & Chu, 1998). Using a variety of designations—instructor-centered vs. learner-centered, collaborative vs. competitive, distributed vs. collaborative, etc.—the characterization typically depends upon the extent to which the faculty lectures (sage-on-the-stage), or actively engages students in shared learning experiences.

Leidner and Jarvenpaa (1995) argue that Web-based courses have the best fit with collaborative learning models because the software used to deliver them facilitates communication between participants. More recently, Benbunan-Fich (2002a) wrote how both objectivist and constructivist approaches can be pursued online through the use of tools and/or activities such as course Web pages, pre-recorded audio/video lectures, Web-based interactive cases, and synchronous or asynchronous computer conferences (Benbunan-Fich & Stelzer, 2002). Some early research reported that the Web supported collaborative constructivist approaches better than traditional classroom courses (Alavi, 1994, Alavi *et al.*, 1995; Chidambaram, 1996; Shrivastava, 1999). Recently, these results were confirmed in a three-year study using large numbers of courses (Hiltz, Coppola, Rotter, Turoff, & Benbunan-Fich, 2000).

Collaborative learning for web-based courses is not universally acclaimed. Some research finds classroom settings associated with greater student satisfaction with collaborative learning (Card, 2000; Ocker & Yaverbaum, 1999; Strauss, 1996; Warkentin *et al.*, 1997). However, Oliver and Omari (2001) found that half their sample of 240 students preferred working alone to working in groups in Web courses. A recent study of 73 courses offered by the SUNY Learning Network (Swan, 2002) found that using collaborative learning techniques was negatively associated with student learning. The next step is to determine if this was because collaborative learning is a failure or because collaboration was poorly implemented. More research is required before we make any definite conclusions on the appropriate pedagogy for the Web.

Classroom Interaction Style

The extent to which quality interaction takes place among course participants is a well-established indicator of Web-based course effectiveness (Fredericksen, Pickett, Shea, & Pelz, 2000; Hiltz & Turoff, 2002; Janick & Liegle, 2001; Larson, 2002; Nulden, 1999; Palloff & Pratt, 1999; Swan,

2002). Hartman, Dziuban, and Moskal (2000) also found that instructors reported increased course interaction in Web courses. It is not clear, however, whether interaction between instructor and students is sufficient. Some studies conclude it is the instructor's role in course interaction that is most critical (Arbaugh, 2000a, 2000c; Fredericksen *et al.*, 2000; Rovai, 2001), while others suggest that the students' role in interaction most significantly predicts student learning and/or satisfaction (Arbaugh, 2002b; Borthick & Jones, 2000; Nulden, 1999; Poole, 2000; Smith, Ferguson, & Caris, 2001). Still other research claims that they are equally important explanations (Coppola *et al.*, 2002; Hiltz, 1993; Jiang & Ting, 2000).

Although the prominence of the instructor's role in course interaction remains unclear, the character of the interaction, specifically instructor "immediacy" behaviors are consistently and strongly associated with student outcomes. Originally conceptualized by Mehrabian (1971), immediacy refers to communication behaviors that reduce social and psychological distance between people (Myers, Zhong, & Guan, 1998). In the Web context, immediacy describes behaviors that include using personal examples and humor, providing and inviting feedback, and addressing students by name (Gorham, 1988). There is increasing evidence that these behaviors are positively associated with student learning and satisfaction with the course format (Arbaugh, 2001; 2002b; Comeaux, 1995; Frietas, Myers, & Avtgis, 1998, Stelzer, 2001a; Swan, 2002). As Web-based courses incorporate a wider variety of media, research studying non-verbal types of immediacy should become more common (LaRose & Whitten, 2000).

Additional instructor-related characteristics that draw a positive response from students include: shifting from a lecture-based to a more Socratic approach (Coppola *et al.*, 2002), integrating online materials seamlessly into the course, and drawing from a broader pool of potential online guests. These studies also find that faculty often develop stronger one-to-one relationships with students in online courses than in face-to-face settings (Coppola *et al.*, 2002; Hiltz & Wellman, 1997; Smith *et al.*, 2001; Swan, Shea, Fredericksen, Pickett, Pelz, & Maher, 2000). On the downside, students in Web-based courses have perceived a loss of spontaneity and increased difficulty for the instructor in getting his/her point across (Smith *et al.*, 2001).

This review of instructor characteristics makes it plain that faculty play a crucial role in Web-based course delivery. Instructor experience, choice and implementation of pedagogy, and instructor interaction with students are associated with student performance and satisfaction and course effectiveness. The strong effects of curriculum and the quality and quantity of interaction may push instructor behavioral characteristics to the forefront of explanation of course success, leaving technological characteristics and variations to the rear (Arbaugh, 2002b).

STUDENT CHARACTERISTICS AND WEB-BASED INSTRUCTION

Matching Students to Web Course Delivery

The increased use of computers and Web-based strategies for teaching and learning challenges professional educators to understand which students will immediately adjust to the changes and benefit and which students will have the most difficulty when confronted with online learning. The possibility of matching students to course delivery and thereby tailoring instruction to student needs is one of the Holy Grails of professional education (Carr, 2000; Green, 1999; Takacs, Reed, Wells, & Dombrowski, 1999; Twigg, 1994). There is a broad consensus on the value of designing curricula that take into account individual learning styles and that more effective learning will occur as a result (Brudenell & Carpenter, 1990; Claxton & Murrell, 1987; Kevin & Liberty, 1975; Raschick, Maypole, & Day, 1998; Riding & Sadler-Smith, 1992; Sein & Robey, 1991). Some have expressed concern, however, that these learning styles have not been as readily addressed in the development of Web-based curricula (Boles, Pillay & Raj, 1999).

Student individual differences not only can account for differences in learning but also can account for differences in doing. Similarly, studies of computer-mediated communication show participation varies with individual differences (Czaja, Sharit, Nair & Rubert, 1998; Hancock & Dunham, 2001). When Davis and Ralph (2001) got disappointing student participation in a Web-based course, they identified issues of gender, culture, experience, and attitude to account for communication variations. This section discusses some important individual-based variables that research has examined in the effort to explain differences in computer related behaviors. These individual differences include computer anxiety, experience, age, gender, ethnicity, and learning styles.

Computer Anxiety and Experience

How does computer anxiety affect Web-based teaching and learning? Recently, Hara and Kling (2000) alerted the education community to the pervasive "frustration, anxiety and confusion" experienced by students in a Web-based courses. Students enter a new world, interacting asynchronously, working alone with greater responsibility and accountability and facing a new combination of flexibility and structure—assuming the technology functions correctly (Cohen, 2001; Davis & Ralph, 2001; Lawther & Walker, 2001).

Disappointing results are not new. In a pre/post-test study of nursing students' attitudes toward general computer-assisted instruction, Brudenell and Carpenter (1990) found that students came out of the experience with more negative attitudes. More recently in a study of students in a medicine course where students were divided into face-to-face and asynchronous electronic groups, Kamin and colleagues (2001) reported that students in the asynchronous groups expressed feeling of isolation from their mentors and difficulty relating to other students in their groups, though, faculty reported no adverse performance effects. By contrast, however, Johnson and Huff (2000) view the Web as a remedy to the real and perceived isolation of students taking classes at distant sites. In a comparison of distance with on campus students, online students reported increased competence using online learning and expressed positive opinions about these supports. Web course experience has been associated with spending more time in the course, logging on to the course site more frequently, being more likely to take additional Web courses and satisfaction (Arbaugh & Duray, 2002; Atkinson & Kydd, 1997; Hiltz, 1994; Ridley & Sammour, 1994). It seems likely that experiences, expectations, and reference groups play a role in reactions to Web-based courses.

Does computer experience reduce anxiety about online learning? The consensus answer is that relevant, positive or high quality experiences—not quantity—have beneficial effects and allay frustration and anxiety. Only computer self-efficacy, not experience, was significantly related to computer-dependent course performance (Karsten & Roth, 1998).

Attitudes toward computing are modifiable. When Czaja, Sharit, Nair, & Rubert (1998) examined age differences in attitudes toward computers as a function of computer experience and task characteristics they found that experience resulted in more positive attitudes, independent of age. The effects of experience, however, were moderated by task and gender. Rosen and Maguire (1990) report success modifying attitudes with psychologically based treatment programs.

Bradley and Russell (1997) have weighed-in on the meaning of quality computer experience. Instruction should allow students to be relaxed when using computers (Rosen & Weil, 1990), should allow positive experiences (Davidson & Walley, 1984), should incorporate the playing of games (Bloom, 1985), and should encourage extensive hands-on work (Barrow, 1985). Similarly, Gardner, Dukes, and Discenza (1993) argue that computer training should be pleasant, rewarding, and non-coercive.

This body of research should give us concern and direction. Faculty and educational administrators should be alert to student anxiety and Web induced frustrations. This discussion is consistent with that in the previous section on instructor characteristics where we noted the importance of instructor immediacy, quality interaction, and faculty experience. Proper course design that provides high quality experiences can allay anxiety associated with Web-based learning.

Age and Web-Based Learning

Is there a computer generation gap? Does aging take a toll on computing skills and performance? These questions are particularly important as Web-based instruction moves to the fore in plans for life-long learning and efforts to upgrade the skills of the workforce. In their 1990 meta-analysis, Rosen and McGuire concluded that age was unrelated to computerphobia. A recent study by Czaja, Sharit, Ownby, Roth, & Nair (2001) reports that older adults are no more negative toward computer technology than younger people but when given computer tasks to perform, they perceived less comfort, efficacy, and control over computers than did the other participants. Their results also indicate that experience with computers results in more positive attitudes for all participants.

Age is related to important computer-related skills. However, there is a strong argument that it is the skill gap not the aging that explains differences in performance found in older adults. Comparing subjects ranging in age from 20 to 75 years, Czaja (1998) found that age, after controlling for these differences in psychomotor skills and processing speed abilities, did not predict work output. Further, after controlling for work output, older people made fewer errors.

What about age differences in a typical Web-based course? Results are mixed. In his studies of MBA students, Arbaugh (2000a; 2000c; 2001; 2002b) found no relationship between age and perceived learning or delivery medium satisfaction. Conversely, Benbunan-Fich and Hiltz (2002) found that graduate students in hybrid courses had significantly higher perceived learning than did undergraduates in either purely online or face-to-face courses. A study of three Web-based sections of a psychological statistics course by Wang and Newlin (2000) reported a significant correlation of r=. 41 between age and course grade. It seems likely that Web-based student performance, like classroom performance, is a function of better study habits, motivation and an internal locus of control, each of which are often associated with maturity (Lawther & Walker, 2001).

Gender and Web-Based Learning

Gender differences in computing have been a topic of concern and comment for 20 years. Do women take to the computer to the same degree as men, are they more anxious about computing, do they use the computer differently, do they value different aspects of computing, do they communicate differently when using the computer, and do they, therefore, comprise a distinctive challenge to Web-based learning? With women comprising more than half of the college population and increasing their

presence and status in the workforce, these questions take on added importance.

Gender Differences in Computer Anxiety and Interest

A large number of studies report higher computer anxiety among women students (Bozionelos, 1996; Gefen & Straub, 1997; Gilroy & Desai, 1986; Igbaria & Chakrabarti 1990; Liu & Reed, 1992; Morrow, Presll, & McElroy, 1986; Rosen & Maguire, 1990). Similarly, Lowe and Krahn (1989) found gender differences in computer skills and usage between male and female students. In a national study of technology use in tenth-grade science and mathematics classrooms in 1990, female students reported that they were less likely to use computers in both science and mathematics than males (Owens & Waxman, 1998).

There are continuing claims that women lag behind in taking computer science classes and pursuing technology-based careers (Hanson, 1996; Green, 2000). However, Ory, Bullock, and Burnaska (1997) report in a study of over 2000 undergraduate students that men and women made similar use of computer networks, had similar attitudes about their computer experiences and shared a common desire to take more courses via the computer. By contrast, when evaluating the Mobile Computing Program that provided laptop computers to all students at Seton Hall University, Collins, Easterling, Fountain, and Stewart (forthcoming) found that female students had lower satisfaction and lower technology use.

A recent Harris poll (Taylor, 2002) shows that women, like men, are on the Internet in numbers proportional to the population. Further, according to Jupiter and Media Metrix (Cyberatlas, 2000) female Internet users in the US surpassed the number of male users in early 2000. The most dramatic growth during the year occurred among teenage girls age 12 to 17, and women age 55 and older. They reported that the sites women visited online did not differ much from the sites visited by Internet users in general. Men, however, make more of the final decisions choosing which PC brand their household will buy (Cyberatlas, 2000).

Gender Differences Communicating on the Web

A variety of research supports the belief that women's distinctive ways of thinking, different interests, and different ways of communicating affect their behavior on the Web. Many studies find gender differences in participation (Arbaugh 2000b, 2000d; Davis and Ralph, 2001; Hancock & Dunham 2002; Wolfe, 2000), but not all find differences (Ory *et al.*, 1997). Wolfe (2000) provides an interesting twist on the issue of male dominance in computer-mediated communication, noting that the research has found that men tend to contribute more turns and more words to online conferences than women (Herring, 1993; Kramarae & Taylor, 1993; Wolfe, 1999). She points out that the results reported in these studies are often only mar-

ginally significant and rarely approach the huge inequities between male and female discourse found in traditional settings. In her own research she reports that White women benefited from Web-based communication, participated more than they did when face-to-face and expressed greater satisfaction with electronic communication. Similarly, Arbaugh (2000b, 2000d) found the that women made significantly more comments than men in an online MBA strategy course and exhibited a significantly stronger pattern of class participation when compared with both genders in a classroom-based offering of the same course. By contrast, Herring (1993) found that women participated less and that their messages were shorter.

Real and perceived differences in male and female ways of communicating over the Web potentially affect the willingness of women to communicate, their styles of communication and their satisfaction with Web-based instruction. Women appear to seek to build more of a sense of community online, whereas men provide longer, more fact-based messages (Barrett & Lally, 1999; Rovai, 2001). Susan Herring (1999) notes gender dynamics in online discussions in which male participants advanced views that were demeaning to women, women responded by resisting the demeaning characterizations, and the men then insulted and blamed the women as the cause of the discord. Ultimately the women complied with male norms or fell silent. Nicotera and Rancer (1994) found gender based stereotyping of two aggressive communication predispositions, argumentativeness and verbal aggressiveness, with males significantly more predisposed to aggressive communication. In addition, both male and female participants perceived males as more argumentative and verbally aggressive than females.

Blum (1999) studied 149 messages posted over a one-month period from an online course and found that men posted nine percent more messages than women. Women posted eighty percent of all questions, but males posted seventy-five percent of all responses. Males communicated more using certainty (seventy-seven percent of messages) females more with empathy (sixty-six percent of messages). Eighty-three percent of the messages with personal references were from women. Men showed a more separated learning style, while women showed more connected empathic learning style. Men used extraordinary long comments and put downs that deterred women from posting. Haythornthwait (2001) writes that social norms and conventions are constantly emerging as members define and redefine their use of the communication medium. Wolfe (2000) notes that the women valued turn taking norms supported by the technology she employed. Savicki and Kelley (2000) speculate that the lack of media richness reduces socio-emotional engagement. Women, they write, may be more willing to engage in argument or "talk back" from a remote setting.

Gefen and Straub (1997) found women viewed e-mail as being higher in social presence and more useful (perceived usefulness) than men. In a subsequent study of college students, Benbunan-Fich (2002b) found that women were more familiar with electronic greeting cards and had a more

positive perception of them than men. These findings are consistent with the recent AAUW report, "Tech Savvy: Educating Girls in the New Computer Age" that distinguishes girls' interest in e-mail from their interest in computing (Green, 2000). This is consistent with Herring's (1993) findings that while women contribute less than men overall, they communicate relatively more on certain topics of discussion, specifically those that involve real-world consequences as opposed to abstract theorizing.

Gender differences may best be perceived in the norms that develop in single sex groups. Savicki and Kelley (2000) found that women-only groups on the Web use a distinctive style of communication. "Women in female-only (FO) groups... established an online presence through use of self-disclosure, use of "I" statements and through directly addressing their messages to other group members. On the other hand, men in male-only groups (MO) ignored the socio-emotional aspects of group functioning and were more likely to engage in a collective monologue approach to discussion with the addition of mild flaming." In a small study, Stelzer (2001b) found that gender differences in learning styles were associated with online learning performance and satisfaction. These results support the suggestion of Sanders and Stone (1986) that female students may be more comfortable in instructional settings, which employ collaborative, rather than individualized, computer learning activities.

Thus, women historically have been slower to take up computing but appear recently to have achieved parity on the Web. Female students have shown greater anxiety and reluctance to use the computer but the data are mixed and the combination of pervasive computing and flourishing e-commerce and e-mail suggest this could change. Gender based patterns of communications are well established and Web-based communication appears to have benefits for female students. It is important to note that many of these findings on distinctive gender effects on Web-based learning were generated in single course studies. Multi-course studies focusing on gender are surely needed.

Persistent gender disparities have encouraged an emerging "feminist pedagogy" addressing issues in computing and web-based learning, asking if instructional technology "serves the needs of women" and suggesting ways of making technology-dependent classes more woman-friendly (Blumenstyk, 1997; Public Broadcasting System, 2003; Zdenek, 1999). As Web-based instruction becomes more ubiquitous, there could be significant educational returns from formulating strategies that recognize and respond to gender differences. Web course designers and instructors should be alert to the potential for perceptual differences among men and women that may well affect patterns of involvement and performance in Web-based courses. However, the penetration of the computer, the ubiquity of the Web and the use and cultural acceptance of e-mail have increased dramatically during the period of these studies. It seems quite

likely the role of gender in Web-based learning will continue to evolve as both men and women adapt to these changes.

Race, Ethnicity and Web-Based Learning

With the popularization of the digital divide (Public Broadcasting System, 2003; U. S. Department of Commerce, 2003), the belief that minority communities are disadvantaged in education and commerce in access to computers and the Web, we might reasonably expect to find research addressing ethnicity and instructional technology. The lack of studies may suggest that with regard to race and ethnicity, though not income, there is no divide. A national study of technology use in tenth-grade science and mathematics classrooms in 1990 found that African American students reported use of computers in both science and mathematics more than Hispanics and White students (Owens and Waxman, 1998). Further, Kirby and Styron (1994) found that African American students have more positive attitudes towards computers than other ethnic groups.

Recent data on adult computer users suggest that race and ethnicity in the U. S. do not hold back opportunities for Web-based instruction (Lach, 1999). In an April 2002, profile of the online population Humphrey Taylor reports that African-Americans and Hispanics compute in proportion to their numbers in the population. Income and education are much better indicators of Web participation, with college graduates and households earning more than $50,000 hugely over-represented.

That race and ethnicity have not affected adoption of computing says nothing about differences in how computers and the Web are being used. Wolfe (2000) notes, "although most current research on classroom discourse now recognizes that ethnicity and gender affect students' communication styles we still know relatively little about how these two variables interact to influence discourse in the classroom." She found that gender-differentiated participation patterns among White students did not apply to the discourse patterns of Hispanic males and females. Unlike their White female peers, the Hispanic women participated frequently in the face-to-face conversations, spoke more than Hispanic males, and generally disliked the computer-mediated conversations. In evaluating the Mobile Computing Program that provided laptop computers to all students at Seton Hall University, Collins et al. (forthcoming) found that African-American students rated learning outcomes more than any other racial/ethnic grouping. The continuing racial and ethnic disparities in educational performance would seem to cry out for comparative studies of Web-based instruction focusing on minority communities and workers.

Learning Styles and Web-based Instruction

Learning style has been called the characteristic way an individual processes and evaluates information, solves problems and makes decisions (Armstrong, 2000). Differences in learning styles result from such things as past life experiences and the demands of the present environment (Kolb, 1984). Professional educators long have sought to match student learning styles to curricula and pedagogical choices (Brenensthul & Catalanello, 1979). Interest in matching has sharpened as educators have recognized students with some learning styles may benefit more from Web-based courses and hybrids (Ross, Drysdale, & Schulz, 2001). (For background on learning style research, see Kolb's Learning Style Inventory (LSI) (Kolb, Rubin, & McIntyre, 1979; Kolb, 1984), Gregoric's Style Delineator (Gregoric, 1982) and Myers-Briggs.)

Which learning style best accommodates learning to use the computer or using Web-based instruction in a subject such as business? In a study that matched learning style with instruction in computer software, Sein and Robey (1991) theorized that computing could be learned best through actual use, implying that active experimenters will learn faster than reflective observers. They also hypothesized that a preference for abstract conceptualization would facilitate learning computing. As a result of their research they concluded that "convergers," a combination of active experimentation (AE) with abstract conceptualization (AC), performed better than subjects with other learning styles.

Green and Parker's (1989) examination of community college students concluded that assimilators (combining AC and RO) possessed more quantitative ability than did other groups. When Kevin and Liberty (1975) compared students in organic chemistry classes who were exposed to computer-enhanced instruction with students receiving traditional instruction, they concluded that the abstract conceptualization (AC) scale varied positively with course grade and that it was "highly related to performance in computer based instruction."

In a study of college students enrolled in statistics and computer science courses, Hudak & Anderson (1990) concluded that the concrete style of learning is particularly maladaptive in statistics and computer science courses. They noted the negative correlation ($r = -.47$) between concrete experience and abstract conceptualization. In a pre/post-test study of nursing students' attitudes toward computer assisted instruction that used Kolb's learning styles, Brudenell and Carpenter (1990) found that students (mostly women) with all four learning styles came out of the experience with more negative attitudes, though not all differences were significant. They concluded that "assimilators," combining abstract conceptualization and reflective observation, were significantly more negative in overall attitude as well as on their subscales. Thus, there appears to be a rough consensus that an AC style supports computing and a CE style does not.

According to Gregoric's (1982) perspective on learning styles, students showing dominance in the sequential dimension (CS and AS) tend to prefer working with computers because the computer is seen as an extension of the sequential person's mind, requiring linear processing and logical reasoning skills. Individuals who score high in the random dimension (CR and AR) require environments that are flexible and intuitive. They are inherently social, enjoy working and learning with others, and may find using the computer frustrating and boring (Butler, 1989). Using Gregoric's styles to analyze the performance of students in two university-level computer application courses, Ross *et al.* (2001) found that dominant AR learners performed the poorest of all learning-style groups in both courses, while sequential learners outperformed each group. These results appear consistent with those based on Kolb's LSI.

The business curriculum is a hybrid of hard and soft skills, combining abstract finance, ratio-deductive accounting and reflective planning with concrete people management skills (Drew & Ottewill, 1998). There are additional vocational components of the business curriculum that call for learning by doing. Finally, since the idea is not to learn how a computer works but to actively engage the computer and the Web to achieve learning and participation goals, active experimentation (AE) would seem appropriate. As Kevin and Liberty (1975) speculate, "In a computerized design laboratory, for example, where the speed of the computer allows more trials of alternative procedures than would be possible with conventional techniques, high AE individuals might gain more from the experience than would high RO individuals."

Armstrong (2000) sees business schools favoring the "analytic style" over the "holistic/intuitive style." This is contrasted with a nonconformist style, relying on impulsive synthesis and lateral reasoning, preferring rapid, open-ended approaches to decision making, and relying on random methods of exploration. He concluded that an "analytic" style was associated with better performance in a senior level undergraduate business school curriculum. Even when the task seemed to favor the intuitive over the analytic, the latter performed better and got higher grades.

Schoolwork in general likely favors analytics. In a study of "university persistence" Drysdale found that students who were dominant in the Gregoric's AS were more likely to persist in university work past their first year (Ross *et al.*, 2001). Dominant AR and CR students were more likely to withdraw. Similarly, when Geiger (1991) studied second- year predominantly business students, he found that students categorized as assimilators (combining abstract conceptualization and reflective observation) significantly outperformed all other students in terms of over-all GPA in their first year in college.

Using Kolb's LSI with undergraduate business students, Stelzer (2001b) found that satisfaction with the course and the Web delivery medium was associated with abstract conceptualization (AC) for men but with concrete

experience (CE) for women. For both men and women, AC was associated with higher grades. For women, however, as CE scores increased so did the beliefs that they successfully mastered the course delivery system and that they achieved the course learning objectives. AC women, by contrast, performed well yet claimed not to have achieved the learning goals and failed to express mastery of the technology.

Wang and Newlin (2000), looking to predict success in Web-based courses, found no relationship between Kolb's learning styles and online learning success, though there is no indication they controlled for gender. They did find that success was associated with a greater internal locus of control (Dille & Mezack, 1991) and a high degree of inquisitiveness (Potosky & Bobko, 2001).

There appears to be a consensus that abstract sequential thinkers do best in school and in computing. Stelzer's (2001b) finding that for women CE scores were associated with course and Web satisfaction is consistent with our discussion of women's different approach to communication and Web-based learning. Perhaps adoption of this instructional technology really does portend accommodating different learning styles. Computing and the Web may indeed add dimensions of experimentation and concrete experience to the learning situation and, thus, provide a threshold possibility for schooling to accommodate different learning styles.

CONCLUSIONS AND AREAS FOR FUTURE RESEARCH

What Do We Know?

Our review of the literature on computer mediated instruction and Web-based courses strongly suggests that, while our knowledge has increased dramatically over the last ten years, we know only bits and pieces about the factors that contribute to successful educational experiences and performance on the Web. We do know that Web-based instruction is successful. Students learn but they are not always satisfied, though sometimes they are more satisfied. Hybrid courses that mix Web-based instruction with face-to-face may get the best results. Variations in student performance are as likely to result from a lack of faculty experience and technology breakdowns as from anything inherent in Web delivery. We know virtually nothing about the relative benefits of synchronous vs. asynchronous communication or the different platforms being used today. Students find Web-based courses flexible and convenient but they can be too large and impersonal. Web-based courses can effectively reach dispersed student populations across institutions and national boundaries but there are pit-

falls. Using the Web as a supplement, hybrids, in these various multi-section environments has been successful.

While mass education has supported the unparalleled growth of wealth in the U.S. and abroad, there has always been the belief that individuals would benefit if educators could customize teaching to individual learning styles. Given the wide variety of options Web-based courses offer, its ability to supplement and complement the classroom, and the opportunity for experimental replications and simulated conditions, the Web holds forth the promise of customized education.

Which students will benefit from the Web? Surely not the minority identified as anxious about computing. Nevertheless, studies strongly suggest that computer anxiety can be overcome if students are given "quality experiences" or therapeutic lessons in computing. The research is consistent that instructor immediacy, a strategy for developing relationships with students that is akin to the factors that go into a quality experience is best for student learning and satisfaction. Students who take Web-based courses tend to take additional Web-based courses in the future, suggesting that their experiences have been positive.

While maturity appears to be associated with better performance on Web courses, aging is associated with diminished skills and discomfort at the computer. Older workers tend to make up in quality what they cannot achieve in quantity. Additionally, the anytime-anywhere flexibility of the Web should work to the advantage of mature workers and could overcome factors associated with discomfort. Because many of the eldest users did not grow up computing, it is premature to generalize from current research.

Similarly, the significance of gender for Web-based education is surely in flux. While slow to start, school girls, working women, and stay-at-home moms are on the Web in ever larger numbers as computing, e-commerce, and especially, e-mail gain ubiquity. While a great deal of literature supports a gender gap in computer mediated communication, this too seems likely to change as society integrates e-mail into the culture and develops more e-mail etiquette and conventions.

Traditional education tends to award the brass rings to the analytics and give the consolation prizes to the Mr. and Miss Congenialities. The learning style of Analytics makes them proficient at processing large amounts of information and testing well. Students who benefit from more hands-on active experimentation or the social construction of concrete experience tend to get short shrift. The ability of Web-based courses to utilize the computer's ability to experimentally replicate and simulate conditions as well as network users promises to offer a wider array of education options to a broader span of learning styles.

Efforts to develop Web-based courses have not been limited to any discipline or subject matter. As far as we know, no one has declared any subject off limits. Interestingly, educators with a constructivist—create learning by

doing—pedagogy have been quick to see opportunities in this medium that others see as too passive. It is difficult to determine whether management education presents unique problems for Web courses. The management curriculum is a hybrid of hard and soft skills, with both analytic and vocational components that put a premium on both critical thinking and interpersonal skills. Computing is both a way to learn and an indispensable way of doing business.

A review of management education publications—*Journal of Management Education, Management Learning, Journal of Education for Business, and Business Communication Quarterly*—shows that there were no articles on topics of distance and online learning published until 1998. Empirical work on using the Web to deliver education didn't appear in these journals until 2000. Collectively, these journals have published fewer than 20 articles about online learning since 1998. Thus, research focused specifically on management education delivered on the Web is in its infancy. We expect that the new education-related journals of the Academy of Management and the Decision Sciences Institute to accelerate the development of this body of research.

A Research Agenda

For the most part, this review has had to rely on opportunity studies based on the experience of individual faculty working in a single discipline and single course. In a study conducted by the Institute of Higher Education Policy, Phipps, and Merisotis (1999) criticized distance education research in general, and Web-based courses by extension, for being much too reliant on single-course studies. The field lacks the systematic knowledge that would come from multi-discipline, multi-course, and multi-faculty large-scale studies that would enable researchers to isolate the significant explanatory variables and address interactive effects.

Partially in response to this criticism, there have been an increasing number of multi-course studies. These provide methodological benefits such as external validity, increased statistical power, and the ability to control for instructor-specific characteristics. As noted above, one of the primary contributions of multi-course research to date is that it has identified the importance of the instructor in Web-based learning (Arbaugh & Duray, 2001). Certainly future multi-course studies will enable a better understanding among structural, faculty and student characteristics and Web course effectiveness.

Multi-institutional studies would create a laboratory in which to compare the variety of delivery approaches across Web degree programs. Today there are nearly as many variations in approaches to delivery as there are schools delivering the courses. Delivery platforms range anywhere from a

combination of e-mail and electronic bulletin boards (Bailey & Cotlar; 1994; Dumont, 1996; Partee, 1996) to Web-based proprietary software that allows for transmission of multimedia, threaded discussions, and chatroom capability (Arbaugh & Duray, 2002; Greco, 1999; Hiltz, 1994; Phillips, 1998). Another continuum upon which schools vary is the extent to which the Web environment is supplemented with other teaching pedagogies, such as the use of streaming audio and/or video, videotapes, video-conferencing, or conducting a portion of a course or program on campus (Alavi & Leidner, 2001; Greco, 1999; Phillips, 1998). So far, studies comparing these differing delivery platforms or supplemental tools of multiple business schools are extremely limited.

The question of whether a particular discipline or academic subject presents a unique challenge to Web delivery is not unique to management education. Indeed, most empirical research treats course content as a given. This, however, is a dangerous assumption. First, subject matter could be a confounding variable influencing the results of the comparison studies of online versus face-to-face courses since these comparisons have tended to focus on a single course or discipline. Second, much of the research focused on faculty "classroom" behaviors rather than their interaction with or delivery of course content. Without further study of the instructor-content relationship, one might conclude that as long as a particular instructor cultivates participant interaction, establishes a clear course structure, and engages in conduct to reduce the social distance between them and their students, that instructor is qualified to teach anything from engineering to the liberal arts to business in an online setting. This approach could call into question the need for doctorally discipline-qualified university faculties to deliver Web-based courses.

As technology advances and our knowledge about online learning increases, future comparative research could elucidate the relative influence of some contextual factors. Does the choice of pedagogy, online communication modes, varying levels of online and face-to-face activities, and software platforms make a difference? Much of the conceptual and anecdotal literature support collaborative learning on the Web as contributing to successful learning (Leidner & Jarvenpaa, 1995; Palloff & Pratt, 2001). However, our review suggests the possibility that declarations of universal support for collaborative learning on the Web may be premature. It may be the case that combinations of collaborative and non-collaborative activities may provide a better learning experience than exclusive reliance upon either.

Future research should also focus on the integration of technology. Comparative studies that focused on the optimal balance of synchronous vs. asynchronous communication would be valuable. The overwhelming majority of studies address asynchronous communication. However, as improved bandwidth allows for better real-time electronic communication and hybrid course delivery arrangements that combine face-to-face and

electronic communication become more common (Alavi & Leidner, 2001; Sorg *et al.*, 1999), there will be increased opportunities to examine alternative modes of online learning. Future research could determine if there is an optimal combination of these communication modes for Web-based courses, and if not, what other factors should determine the relative allocation of communication modalities.

Management education research would also benefit from studies that examine Web-based instruction from a programmatic rather than course-level perspective (Alavi & Leidner, 2001). A critical issue for the success of online degree programs is the need to insure a minimum quality threshold for all courses. An uneven level of faculty expertise and course quality could exacerbate student frustration, especially as the novelty of Web-based learning declines. With greater transparency of online programs, increased student ease of access and fewer student sunk costs, quality assurance will become particularly important for colleges seeking to market their programs beyond their traditional student populations.

One way to increase quality is to generate effective knowledge transfer among faculty. While initial research shows a strong relationship between faculty online teaching experience and student learning (Arbaugh & Duray, 2001), faculty experience-based knowledge seldom is transferred to other faculty members. While instructional designers and other support personnel have helped faculty produce quality Web-based courses (Gallini, 2001; Kang, 2001), programs would be well served by faculty collaboration to standardize quality. Research that identifies models and incentives that support such collaboration is desperately needed.

Studies of the learning curves of faculty and students as they navigate Web-based education could be particularly helpful. As in any new educational endeavor, novice teachers and students have been the focus of much of the research (i.e. Arbaugh, 2001; Coppola, *et al.*, 2002). We do not know, for example, if and how experienced online instructors conduct their courses differently than those teaching for the first time. Further, is the ballyhooed "more work" attributed to Web-based instruction (Berger, 1999; DiBiase, 2000b; Hartman *et al.*, 2000; and others) still true for instructors after they've taught two or three web-based courses? From a student perspective questions that should be addressed include: How are experienced online learners different from tyros? How should instructors structure and/or conduct their Web courses differently when students are experienced?

Much of what we know about individual reactions to computing and the Web, reflect catch-as-catch-can adult adaptations to the changing world of computing. As children grow up with computing will computer anxiety remain relevant? Does anxiety arise from new applications of computing or can experienced computer users easily generalize their skills to adapt to new applications? Similarly, are boys and girls growing up with unisex computer conventions that support uniform responses to Web-based learning

experiences? If not, will compatibilities between women's ways of communicating and the networking potential of the Web provide women with educational, social, and occupational advantages?

Racial and ethnic differences in responses to the Web have yet to be studied. Do diverse populations use the Web differently and are Web courses neutral on diversity issues? Low incomes are associated with diminished access to the Web and this could mean that the poor will not have access to Web-based instruction and the modern work world? Throughout history the poor have had limited access to the tools that would make them rich—education, books, transportation, communication, etc. Is the Web, however, actually a great democratizer that will give disadvantaged populations all the advantage they require to become educated and modern workers? Web courses have the potential to overcome the constraints associated with face-to-face instruction and education bureaucracies.

The research on learning styles strongly suggests that Web-based courses can address learning style differences as well or better than the traditional classroom. Learning style should be an important consideration in the design and promotion of Web courses. Towards this end it would be helpful to have large-scale experimental studies that identify those aspects of Web-based courses that lead to successful learning among students with particular learning styles.

To conclude, the intention of our review is to assist faculty to understand the factors associated with successful online education and help focus the research agenda for online management education. With the growth of online programs, greater use of Web-based instruction, more emphasis on teaching in traditional journals, and creation of new field-specific education journals, we see unbounded opportunities for research on management education. Even if only part of this agenda is adopted, we expect to be amazed by the advancements in knowledge by the time the next volume in this series dedicated to learning technologies is published.

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CHAPTER 3

ONLINE SIMULATIONS IN MANAGEMENT EDUCATION ABOUT INFORMATION AND ITS USES

Sheizaf Rafaeli, Daphne R. Raban, Gilad Ravid, and Avi Noy

This chapter reports on computerized simulation/games developed and used in graduate and executive education of managers (MBA programs). Our purpose is to describe a few internet-based, computerized simulations devoted to teaching management skills. In the following, we discuss some of the unique opportunities to teaching and learning made available through the use of such online simulations, drawing on a series of simulations we have developed and implemented in a large number of managerial training and education settings.

Managers may be among the toughest candidates for education. The personality and conduct expected of managers may diverge from the leisurely, inquisitive and in-depth nature to which academe is accustomed. Quite to the contrary, managers, and often managers-in-training, are often expected to want to cut-to-the-chase. They are less patient with theories.

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Managers as well as students of management are often selected for the personality and behavior traits of brevity and practicality. How then do you convey complex, abstract notions to such students?

Managerial theories, on the other hand, are among the more complex, involved, and contingent of the behavioral theories. Furthermore, the transition from theoretical knowledge to the ability and propensity to implement abstract knowledge in a highly abstract area like management is not simple. How, then, do we get managers in training to be excited about the subject matter they learn, internalize the knowledge, and be more likely to put such knowledge to use in real life situations?

Online, computerized and network-mediated simulations amplify many of the traditional advantages of games in learning. Adrenalin rush, attention, and motivation are at their peak in simulations (Harper, Squiers, & McDougall, 2000; Rieber, 1996). Consequently, learning stands a better-than average chance. Our argument and expectation, now supported by several years of experience, is that simulations, especially of the computerized and online variety, are likely to be part of the answer to the difficulties of conveying complex and abstract ideas to managers and managers in training. Discussions and debriefing that follow the experience of a competitive or dynamic simulation tend to be the best and most internalized learning experiences (Parker & Swatman, 1999; Rafaeli et al., 2001, 2002b).

ONE GAME IS WORTH A THOUSAND WORDS

The spirit of "one game is worth a thousand words" is captured when game playing is harnessed as an instructional tool. A fairly brief simulation/game session can deliver a strong message and modify attitudes that would otherwise take many hours of reading, lecturing or work on written assignments. The effectiveness of various business and e-commerce simulations is widely accepted and has been documented in previous research (Cox, 1999; Croson, 1999; Parker et al., 1999; Yeo & Tan, 1999).

Despite their utility, simulations are often avoided by teachers. The main reasons that inhibit using simulations in the classroom are the logistics of managing classes and groups during games, the time consumed by simulations and the special difficulty in simulating social situations. Following is a discussion of how computerizing and placing simulations on the internet can provide added value, and decrease the barriers to use of simulations..

Well-developed computerized simulations can remove many of the inhibitors that are built into traditional games. Computerizing games may add value to the teaching process by controlling unintended errors, reduc-

ing cheating errors, increasing result precision, easing the administration chores, cutting down on setup and explanation time, teaching more by reducing the cognitive load, allowing the player to focus on decision making, enabling easy manipulation of the game parameters, and creating a more amenable infrastructure for evaluation and development research.

Computerized games delivered over the internet allow even more advantages. Networked games place developers much closer to their customers, enabling faster customization and parameter tweaking. Internet-based delivery allows international distribution of games, and international as well as intercultural participation (Cox, 1999). Play itself is no longer limited to a single location. Internet-based delivery of simulations allows a-synchronic games, and enables the meeting of players from a variety of linguistic and cultural backgrounds.

Computerized games can be classified and compared by the nature of competition embedded in their topology: player vs. machine, player vs. player, and player with player. In the simplest case, simulations can be played in solitaire fashion, wherein each participant/student faces their own challenges and learns their own lessons. This is both the most popular and simplest form of game. With the advent of computer-based simulations, these were the first form of simulations to evolve. Alternatively, games can be an opportunity to pit players against each other. In games of this sort, participants encounter the presence of others. There is a different set of skills and thought processes required to acknowledge, process and compete with others for resources and wins. A third possible format for games, in general, and in computerized simulations in the service of management education in particular, are games featuring collaboration, cooperation, and sharing among participants.

In this chapter we report on, and compare all three types of games. We have developed and run these games with many hundreds of participants, in numerous universities and corporations from several countries. As the games are computerized, each round leaves behind quantitative tracks in the form of logs. These data can be used in both short-term de-briefings immediately following the experience, as well as in longer term evaluations with the participants and in research.

We will describe the following games, one each representing each of the three categories described above:

1. *Lemonade Stand II:* A computer implemented market for information.
2. *Online Auctions:* Computer implemented markets where sellers set the rules and buyers set the price.
3. *Supply Chain Management Simulation: N*etwork mediated disintermediation?

LEMONADE STAND II: THE MARKET FOR INFORMATION

General Description of the Game

The lemonade stand simulation-game is based on the traditional individual business game, in which each participant is expected to balance business inventory and cost considerations in anticipation of a demand pattern set by the market. Managers playing this game usually demonstrate a less-than rational behavior toward information, showing a strong preference to consuming information regardless of the usefulness of that information.

The game is given as part of a lesson plan dealing with information economics. The meeting starts by explaining the purpose of the game and its rules. The purpose of the lesson is to call attention to the peculiarities of information as a good and to discuss what kind of information can be useful for decision-making. The misuse of information during the game triggers a lively discussion during the debriefing that comes after playing. The lesson ends with a formal lecture on the value of information. Some of the main points of the lecture are highlighted by the students' game performance and thus, we believe, the lesson is highly effective in producing better infosumers.

Motivation for Simulation Development

The Lemonade Stand simulation was developed as a tool to examine the value of information in trading and sharing situations (Rafaeli & Raban, 2003). Information has several unique characteristics that render it difficult to valuate. Information is an unusual good in terms of production, distribution, and consumption. Information is expensive to produce and cheap to reproduce (Bates, 1989; Shapiro & Varian, 1999). In fact, distribution is done mainly by reproduction or copying. Digital information is virtually costless to copy meaning that cost is irrelevant to valuation, in contrast to physical goods. People consume information both by sharing and by commerce while most other goods are consumed by commerce only. The existence of these two different modes of obtaining information may suggest interdependence between them. Such interdependence may influence value perceptions in both modes. For these and other theoretical reasons, the value of information is subjective and reflects individual perceptions rather than an economic formula (Ahituv & Neumann, 1986).

Our simulation helps reveal actual individual behavior and subjective value. We discover the value of information by giving players opportunities to place their private value bids for information. Theoretical background

which supports this methodology comes from research on the Endowment Effect (Camerer, 1995; Horowitz & McConnell, 2000; Kahneman, Knetsch, & Thaler, 1990; Thaler, 1980; Thaler, Kahneman, & Knetsch, 1992).

Briefly, the Endowment Effect shows that people's willingness to pay (WTP) for an object is much lower than their willingness to accept payment (WTA) for the same object. The disparity between WTA and WTP is much larger than can be explained by traditional economic assumptions such as diminishing marginal value or bargaining. During the game players are asked to place their bids for WTA and WTP using an incentive compatible method known as the BDM method (Becker, DeGroot, & Marschak, 1964).

We have applied the WTA/WTP bidding mechanism to the Lemonade Stand, in a manner which requires only minimal instructions to the user and is easy to operate. There is no prior background required in business or economics or computer operation. Players are drawn into the game thanks to its simplicity, amusing animation, the feedback it produces, and the promise of a prize for the best lemonade seller (player with highest profit). While paying attention to maximizing their profits, participants are not necessarily aware of the main focus of the simulation, the value of information. Class discussions during debriefing reveal this blind spot to the surprise of participants. This makes the value of information all the more important and memorable for the future. The ensuing lecture on information economics is then received with much interest and motivation to explore the peculiar nature of information as an economic good.

Detailed Description of the Game

In the original version of the Lemonade Stand game, participants were expected to run a small business, a lemonade stand. Based on previous work by others, we developed a computerized, Java, Perl, and Oracle over http implementation of this game. The simulation-game is played in a Java applet delivered to participants' browsers over the internet. The original applet was programmed by Derek L. Ramey, with improvements added by Ravid, Rafaeli and Raban. All behavior by participants, all decisions made, and all outcomes are recorded and reported online to the server. We add a special challenge to the cyclical issues of predicting and managing customer demand, marketing, and production scheduling issues. In our improved version, participants are also drawn into an information market. In addition to regular production, pricing, and inventory decisions, they are offered the opportunity to buy or sell information pertinent to the managerial decisions. Hundreds of participants have played this game in multiple iterations each.

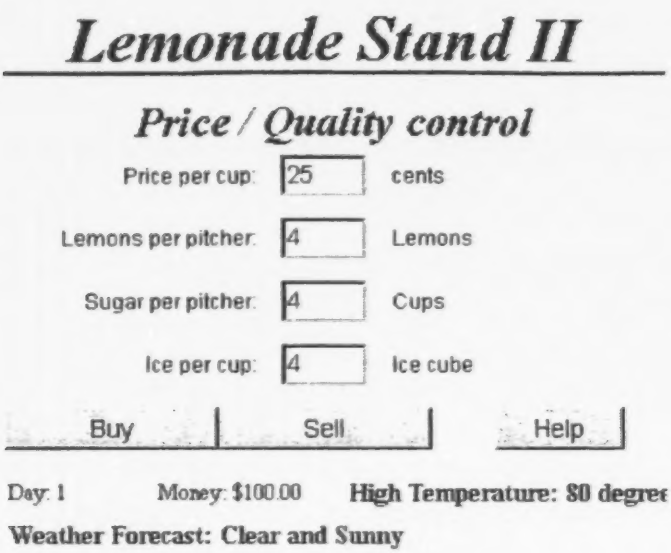

FIGURE 1
Lemonade Quality and Price Determination Screen

In this simulation the player owns a lemonade stand and must operate it so as to maximize his/her profits by selling to passers-by. Participants make quality, pricing, and inventory decisions. Each player is permitted to modify product quality parameters for the lemonade (amounts of sugar, lemons, and ice) and may also set the price charged per cup. Furthermore, players decide how much inventory (lemons, sugar, paper cups, ice) to purchase at each round (day), such purchases to be selected from three predefined options per raw material. Price, quality, and inventory decisions are affected by information about weather conditions, made available prior to each business day (Figures 1, 2), and also by the reactions of their clients, which appear as textual bubbles above their heads during the trading day (Figure 3). After entering all quality, inventory, and pricing decisions the player presses the "sell" button at his/her leisure to start the trading day. Selling is done automatically, based on the parameters entered, and cannot be interrupted by the player. During the trading, the player sees an animated representation of the stand, clients walking by, and the textual feedback with comments from clients. Typically, a "day" takes two minutes. At the end of a business day the player is given feedback about clients' satisfaction (Figure 4). After playing for several consecutive days, which constitute a cumulative "game," the player is notified of the clients' satisfaction, inventory losses (Figure 5) and the overall net profit or loss (Figure 6). Players are urged to maximize their profit and are rewarded monetarily according to the actual profit achieved. The simulation enables different language interactions. We have run it in both Hebrew and English to the benefit of native speakers of each language.

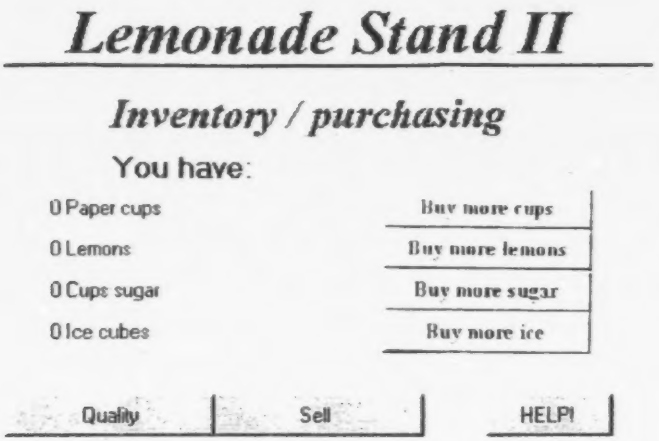

FIGURE 2
Lemonade Inventory Control

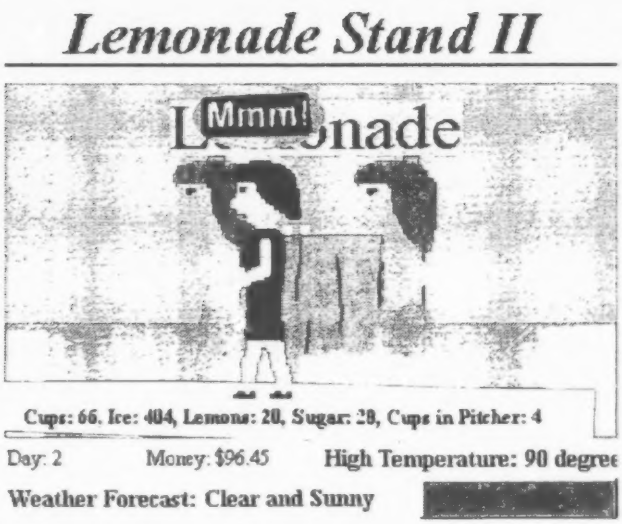
Lemonade Stand II
Mmm!
Cups: 66, Ice: 404, Lemons: 20, Sugar: 20, Cups in Pitcher: 4
Day: 2
Money: $96.45
High Temperature: 90 degree
Weather Forecast: Clear and Sunny

FIGURE 3
Lemonade Animated Business Day Including Weather Information, Total Income, and Inventory Status

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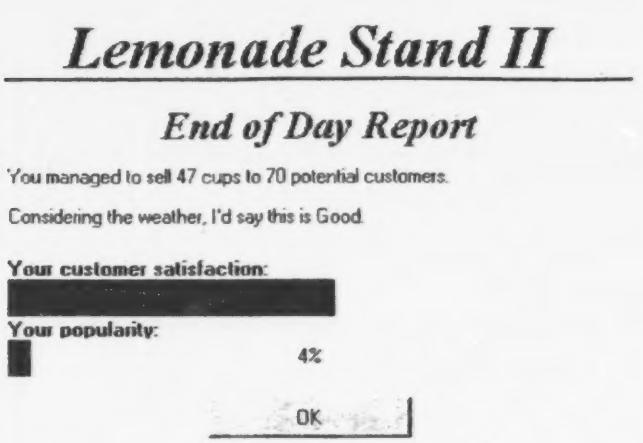

FIGURE 4
End of Business Day Report Including Information on Client Satisfaction and Popularity

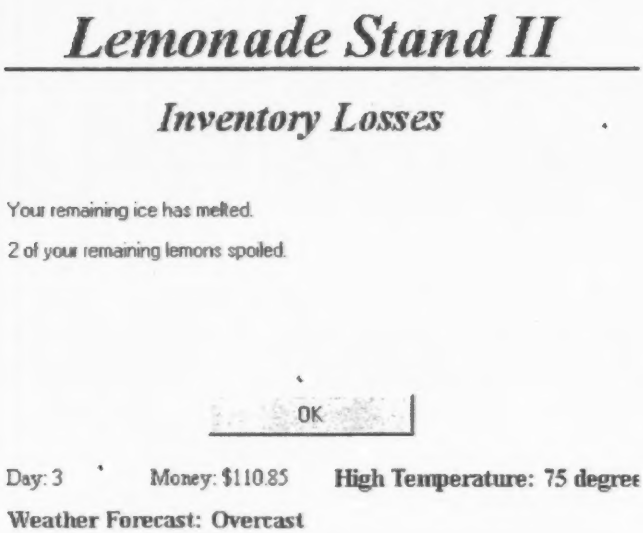

FIGURE 5
End of Business Period (3 Business Days) Report on Inventory Losses

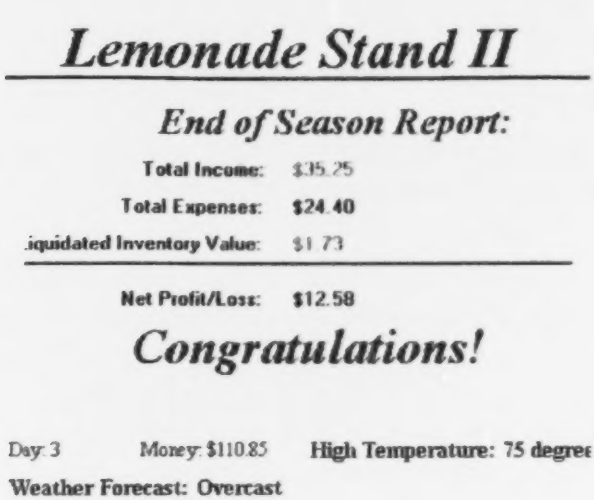

FIGURE 6
End of Business Period Report Including Gross Income, Expenses, Inventory and Net Profit or Loss

Information Aspects of the Game

As in real life, the Lemonade Stand simulation game involves the use of both explicit and implicit information: Visible information as well as desirable, but not available, information. Visible information is unambiguous information which appears on screen and is available to all players equally. Some examples include: Prices of various ingredients and raw materials, weather information, when available, customer feedback, and net profit or loss at the end of a game period. Visible information can be seen in Figures 1-6.

Desirable but not available information is information that would greatly help the players but is not available on screen. The players must deduce this information by themselves or play intuitively. Most players choose to play intuitively. Examples for such information include the best lemonade price for given weather conditions, best lemonade formulation for given weather conditions, number of people who will pass by the stand for given weather conditions (market demand). Table 1 summarizes the availability of information in the game. It highlights two interesting points:

1. Many types of information are available for manipulation in this simulation.
2. Weather conditions influence pricing, formulation, and market demand.

TABLE 1
Visible and Deduced Information in the Lemonade Stand.

Visible Information	*Deduced Information*
Weather information	Best lemonade price for given weather conditions
Prices of cups, lemons, sugar, and ice	Best lemonade formulation for given weather conditions
Help screens	Number of potential clients that will pass by the stand for given weather conditions (market demand)
Feedback bubbles during the game	
Feedback summary at the end of a business day	
Inventory losses at the end of a business period	
Net profit or loss at the end of a business period	

Therefore, information about the weather is important to players of the game.

Hence, we have chosen to manipulate weather information. Instead of making weather information available by default, we have created an information market. Players who do not have information but wish to purchase it, are given an opportunity to submit a purchasing bid. Players who have information are given an opportunity to submit a selling bid. Each player is given opportunities both to buy and to sell information. The bids reflect the players' willingness to pay or accept payment for information thus shedding light on their information purchasing and usage behavior.

In a somewhat more complex version of the game we add two dimensions: Originality of information and source of information. By originality we distinguish between exclusive information and copy information. By source we differentiate between information products (for example, a document) and personal knowledge (for example, expertise).

In a further version of the game we conduct an "information bazaar" rather than an information market. Instead of buying and selling information we seek information sharers thus checking people's propensity to share. Technically this is done by adding a chat system to the game and collecting the players' responses.

In summary, the Lemonade Stand simulation is a tool which allows experiencing information economics before formal learning. When a formal lecture follows managers are more open and responsive to the material taught. We have seen that experience given by this controlled tool is an

effective method to correct the misuse of information and the inclination to hoard information.

ONLINE AUCTIONS

The second simulation described here is an example of a setup that emphasizes the presence of others (in the game as well as in real life). The point of this simulation is to highlight social and interactional aspects of economic behavior. The importance of demonstrating economic behavior to managers, especially in an electronic environment, is obvious. Managers can draw conclusions about best practices for their companies' e-business endeavors.

Online auctions are one of the most dominant examples of online behavior, and are rapidly becoming a dominant mode of economic and managerial behavior. Auctions are a meeting place for both electronic commerce and mass adoption of online arrangements. Auctions in general, and online implementations of the auction format in particular, are of both research and training interest for a variety of reasons (Kagel, 1995). They represent a renaissance of dynamic pricing regimes, and a challenge to the prevailing fixed pricing arrangements. In auctions the seller sets the rules but the buyer determines the price. Game theorists have turned their attention to auction behavior, as auctions are considered by some of the pure markets, at least potentially (Vakrat & Seidman, 1999). The estimated value of business conducted in auction mode as a proportion of total business continues to increase (Chui & Zwick, 1999; Jap, 2001; Sarkar, Butler, & Steinfield, 1997).

The social impact of electronic commerce has received little direct treatment in research (Herschlag & Zwick, 2000). The social impact on electronic commerce has received even less attention so far. The auction simulation is an attempt at theoretically frame and examine this impact, while allowing participants to experience the process, frenzy, and vicissitudes of actual auctions under close-to-real conditions.

The online auctions described here are two standalone simulations of a "Dutch" descending price auction and an "English" ascending price auction.

Our research and these simulations focus on the growth in online auctions, and the emergence of instant messaging and communication availability technologies. These trends merge in our research to provide a collaborative online social framework in which computer mediated communication may affect the behavior of participants in online auctions. The interactions between buyers and sellers in traditional, face-to-face markets create social phenomena such as social facilitation and social influence

where the presence of others impacts behavior and performance of the participants.

The Simulation Framework

Each simulation is self contained and delivered online, enabling the participant to experience the simulation without any additional trainer interference. The simulation operates concurrently on the client and the server computers and enables simultaneous execution by several participants at once.

In the client side, the simulation runs as a Java applet operating on any Java supporting Internet browser. Each simulation is wrapped with HTML pages and CGI scripts operating at the backend. The server side includes the Web server.

Both the "Dutch" and the "English" simulations are supported by maintenance scripts that provide control over the appearance of the auction, by manipulating the various parameters, and ability to collect data gathered during the simulation and store it in a database on the server.

What Have We Simulated?

Our aim was to generate a standalone auction framework/experience for each participant. This framework enables participation in what seems to be a believable, real auction. Face validity of the simulation and the sense of immersion are crucial for both research and training purposes.

Each simulation is composed of the following modules:

- Auction management—this module is responsible to execute the auction according to the auction rules and present this general information to the participant.
- Participant simulation—this module is responsible for simulating the other participants (see below).
- Visualization and computer mediated communication—this module presents in various ways the other participants and implements instant messaging mechanism to enable a simulated chat environment.

The Dutch Auction Simulation

Ball (Ball, 1997), originally developed the Dutch auction simulation. It is a Java based applet implementing an online Dutch auction that simulates

both the auction environment and the other auction participants. This simulation was adapted and extended to serve as a framework of a research on social facilitation during online auctions (Rafaeli & Noy, 2002a).

In this simulation, (http://research.haifa.ac.il/~avinoy/auction/) participants face a trading screen where they may bid for merchandise under "Dutch" (i.e. descending price) conditions. Their performance (market savvy and profit) is compared, online, with other participants. We added several modifications and variations on the original theme. The simulation exposes participants to varying levels of pressure, as expressed in time constraints and pace, as well as in the graded availability of information about, and synchronous communication access to other participants in the auction.

In the Dutch auction, the participant faces an auction clock that displays the descending price. In our simulation, this clock appears in the upper left corner of the screen (Figure 7). The clock starts at a relatively high price, which is lowered periodically by the auction mechanism. The current price is displayed both on the clock and in the text field above it. The auction starts after the participant presses the "Begin" button. Bidding is done by pressing a "Bid" button. The first participant who bids stops the clock and "wins" the auction and the object. The results of the auction are displayed in the middle of the screen. Since the Dutch auction is short in time, the simulation is able to perform several consecutive auctions, gathering cumulative data and saving it.

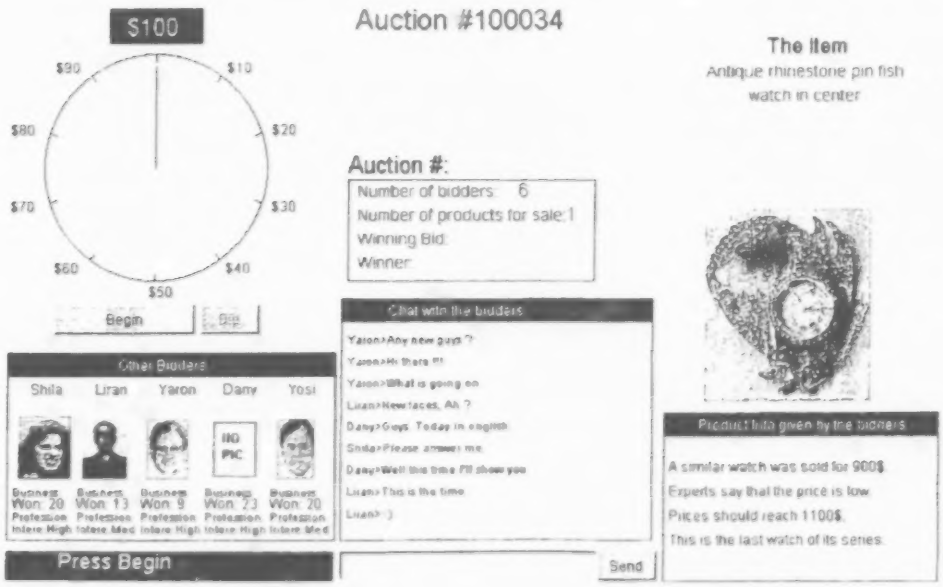

FIGURE 7
The Dutch Auction Screen

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The varying levels of virtual presence are controlled and manipulated by the research design. We hypothesized and our findings indicate that as the virtual presence of the other bidders is increased, a social facilitation occurs. In a training context, the simulation helps experience the process of bidding, as well as the attendant social dynamics that surround it.

Psychological processes have been emulated by computerized simulations for over two decades, see, for example, (Steinhauer, 1986). In our simulation we tried to simulate both the bidding behavior and the synchronous interaction between the bidders.

Since auctions are social processes (Smith, 1989) and used for commerce, the bidding behavior is affected by numerous parameters. All simulations are based on a model. A model is a simplified but accurate representation of some aspects of the real world (Maidment & Bronstein, 1973). In both situations (ascending and descending price auctions) we modeled the important variables and built a dynamic simulation that drives these parameters.

As human behavior is hard to simulate, the development of a social simulation is more difficult than the development of a physical simulation. There are fewer reliable rules to this behavior. Thus performance of people in groups is more difficult to predict. There are simply too many variables with which to contend (Maidment & Bronstein, 1973). This is precisely the point of the online auction simulations.

In Dutch auctions participants may bid only once per descending price round. The first bidder wins the object that is auctioned. Usually the Dutch auction is shorter than the English auction. These two characteristics may affect the participant of the Dutch auction, differently. The model is constructed of the following parameters:

- Basic characteristics—Including name and picture of the bidder.
- Bidding characteristics—In order to distinguish between bidders, they were categorized according to their bidding experience level and their auction participation type (business vs. amateur participation).
- Bidding decision—Whether to bid for the object on the auction or not. This decision is based on other parameters including the bidder limit.
- Bidder limit—Our research hypothesized that even though the price that the bidder is willing to pay is not always clear to the bidder in advance or even after the auction has begun, a limit exists and can be influenced. This parameter specifies the price limit in which the bidder will bid for the object.

The bidder model in the Dutch auction simulation is simpler than the model of the English auction simulation that is described below.

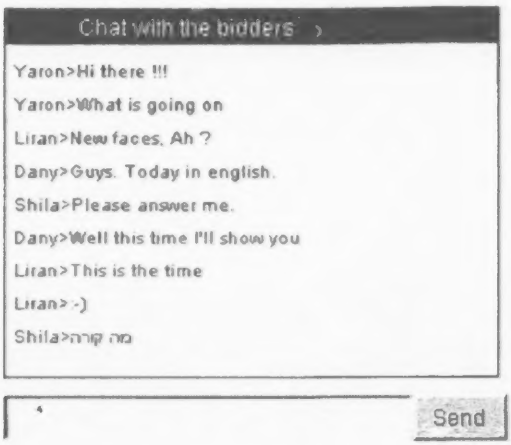

FIGURE 8
Simulated Chat in the Dutch Auction

Simulating Participation in an Online Chat

The Chat simulation aim is to increase the level of virtual presence of the other bidders. As the other bidders are simulated, the chat is simulated too. Messages posted to the chat by the simulated bidders were displayed to the participant. The participant can send messages by typing a sentence in the message line and pressing "Send." This message will also appear in the chat window (Figure 8).

The simulated chat is constructed of three sets of messages originated by the simulated bidders. Table 2 summarizes the usage of these sets.

The chat model consists of the following parameters:

- Sentence—Every set contains several sentences. Each sentence to be displayed is selected randomly from this collection. Once used, sentences are marked and dropped from the set. This avoids repetition

TABLE 2
Simulated Chat in the Dutch Auction

Message type	*Usage*	*Initiating event*
Regular	Used periodically by all simulated bidders	1. Beginning of the auction 2. Periodically
Win sentences	By the auction winner	Winning the auction
Lose sentences	By other auction bidders	Loosing the auction

of sentences that might affect the perceived realism of the chat process.

- Initiating bidder—In case of periodic messages, this parameter specifies the bidder that will initiate the message.
- Initiating rule—Not all messages are issued immediately. This rule specifies if the winner, the loser or a periodical message will be issued at all.

Using this set of rules we ensured and verified (Rafaeli & Noy, 2002a) perceived realism of the chat.

The English Auction Simulation

The English auction simulation (http://research.haifa.ac.il/~avinoy/auction/) is a Java based applet implementing an online English auction. It simulates both the auction environments and the other participants under different virtual presence conditions. The participants are offered an ascending price auction where they can bid for an object that is displayed on the screen.

English auctions have many variations (Lucking-Reiley, 2000; McAfee & McMillan, 1987). The English auction simulation enables realization of a minimal bid and a minimal predefined bid increment. The participant may bid several times by entering a bid in the appropriate field and pressing the "Bid" button. In all conditions, the picture and the description of the object that is sold are displayed. In different settings, as presented in the following figure (Figure 9), additional information about the other bidders is displayed.

The upper left window is the proxy window, which describes the bidders in the bidding room in a radar like layout. The proxy idea is based on

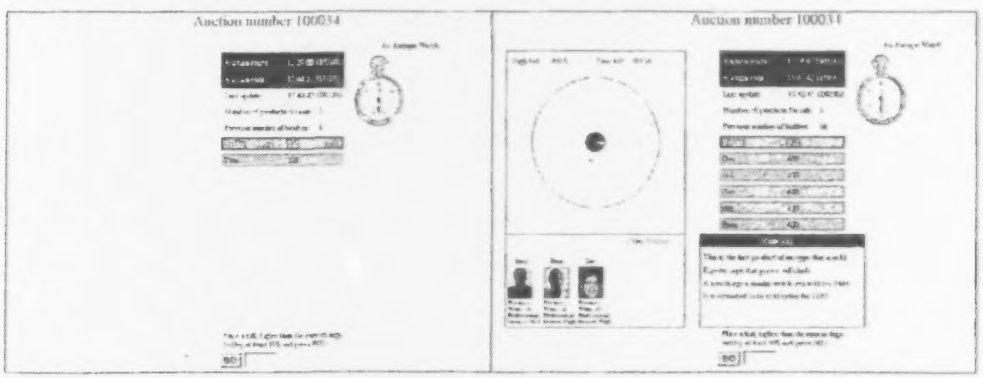

FIGURE 9
The English Auction Simulation: Low and High Virtual Presence

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Erickson at el. (Erickson, et al., 2001). The bounding circle represents the bidding room. First time bidders just joining the room, (i.e., watching but not yet contributing), are represented by color dots outside the circle. When a bidder posts a bid, the bidders' dots move towards the center of the circle. Higher bids are displayed closer to the center of the room.

Each bidder has a "bidding path" (angle) from the outside to the middle of the room. When the bidder places a new bid, the dot is moved on the path towards the middle of the room. Other dots are rearranged according the new high bid. The participant itself is represented using a red dot. The participant bidding path is vertical from the top of the circle towards the middle. When a bidder does not respond for more than 30 seconds, the bidder's dot changes into a small gray circle and an indication is given to all the participants in the message line. Other indications are given when new high bids are posted and when a new participant arrives.

The red circle in the middle of the bidding room represents the clock—the time remaining for the auction. The clock circle is initially empty. As the auction time passes it is painted red. When the auction ends, no more bidding is allowed and an indication is given to the player. The upper middle window displays information about the auction. It includes data about auction start time, auction end time, last update time, number of products that are sold on this auction, number of previous bidders, a list of the five highest bids arranged in descending order, and a total interested web surfers who visited the auction—whether they participated or not. The lower left window may display information about the other bidders. This information arrives from the bidder model.

Additional information about the product may be presented to the participant, depending on the auction settings. This information appears in the bottom window.

Simulation of Bidding Behavior in a English Auction

The English auction is characterized by an ascending price mechanism. The auction participants may bid repeatedly (if at all) in response to other bidders' behavior. This mechanism was translated to a bidding model that takes into account the following parameters:

- Basic characteristics—Including name and picture of the bidder.
- Bidding characteristics—In order to distinguish between bidders, they were categorized according to their bidding experience level and their auction participation type (business vs. amateur participation).

- Arrival time—The time that a bidder joins the auction. While this parameter is applicable to an English auction (since the auction lasts for more than a few minutes), we neutralize it in the Dutch auction simulation, when we assumed, due to the short auction time, that all participants are attending the auction from the beginning.
- Bidding decision—Whether to bid for the object on the auction or not. This decision is based on other parameters.
- First bidding time—The first time that the bidder places a bid (after arrival).
- Reaction time—How long it takes for a bidder to analyze the previous bid and decide whether to raise their bid.
- Bidder limit—As is the Dutch auction case, we hypothesize that a limit exists and can be influenced. This parameter specifies a price limit in the bidder model.
- Bidder next bid—After someone else has raised the bid, the bidder may choose to raise it again. This parameter specifies if and by how much the participant will raise the bid. This parameter is tightly connected to the characteristics of the bidder.

A screen shot example of our English Auction simulation is given in Figure 10.

In summary, the online auction simulations are a use of the computer and the net to experience the presence and influence of others in one of the most quintessential economic behaviors: bidding and competition in a

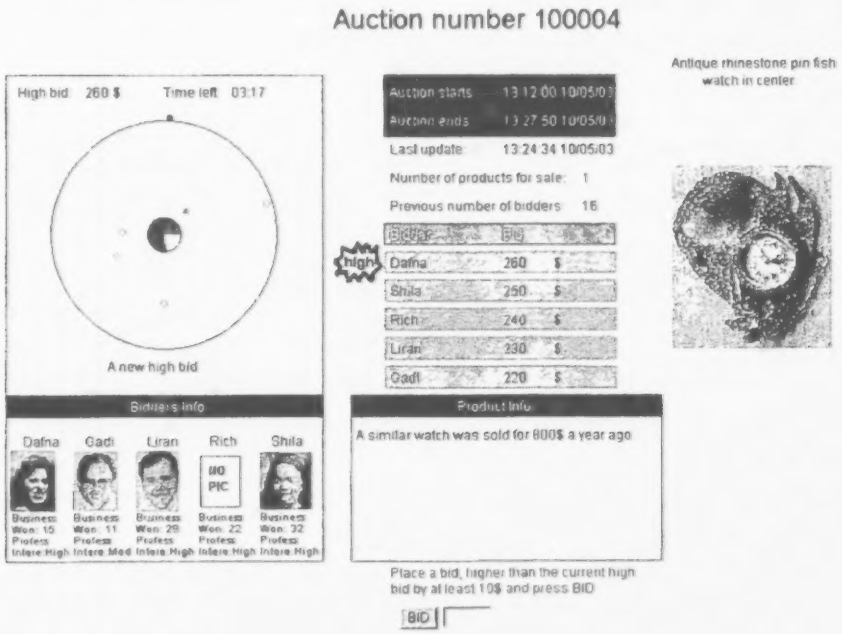

FIGURE 10
The English Auction Simulation

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market. We use simple as well as sophisticated techniques to express the presence of others. Research results reported elsewhere (Rafaeli & Noy, 2002a) indicate that participants are in fact impacted by the simulated presence of others. Informal observations and conversations with students and trainees suggest that these simulations are a very memorable experience for the participants. The social aspect of processes can be articulated through artificial online stimuli.

SUPPLY CHAIN MANAGEMENT SIMULATION: NETWORK-MEDIATED DISINTERMEDIATION?

Interaction Among Groups of Managers

In the context of work, a group is a designated collection of two or more individuals working together in a dynamic, reciprocal and adaptive manner to achieve specific, common and valuable goals (c.f. (Bowers, Sals, & Connon-Bowers, 1997)). The simulation of group activity is especially attractive and uniquely complex. Hulia, a computerized version of the beer game, is designed to highlight the intricacies of inter-organizational groups and the bottlenecks that characterize their work. Managers have indicated that participation in Hulia has given them unique insight into problems of information flow and into concepts such as intermediation.

Modern work groups operate in a rapidly changing environment. Such contexts require learning processes and practices. The efficiency and flexibility of work groups requires structure that enables and encourages the exchange of information. Information flow and exchange are essential for group survival (Senge, 1990; Senge et al., 1999; Sproull & Kiesler, 1991). Organizations and teams do learn from their individual members, but there are barriers to the processing of the information that is garnered. Thus, the sharing of information among work teams, and the flow of information in an organization are an important issue for design, study, and experience (Olson, Olson, Storrosten, & Carter, 1993; Sproull et al., 1991; Townsend, DeMarie, & Hendrickson, 1998).

What is the Beer Game?

The Beer Game, known also as Sterman's production-distribution simulation, was invented and developed by the Dynamic Systems group at MIT's Sloan School. The original game is described fully elsewhere (Senge, 1990; Sterman, 1989, 1992a, b). The original version used a board-game architecture and has been used extensively in the literature about process engi-

neering and the management of supply chains. This simulation is a competition between groups. Each group is charged with maximizing the aggregate team profit, but individual participants are only offered information about their personal performance and standing.

A distribution system is simulated, in which each group stands alone, comprising four roles along the supply chain: Factory, Distributor, Wholesaler, Retailer—fulfilled each by a different participant. Participants send orders up the chain while producing and shipping products down the chain (see Figure 11). Delays are introduced in the delivery of information about orders and in the simulated flow of shipments. Participants are forwarned about the delay.

The general structure of structure of supply chains as well as the chain in this game is such that the Retailer is closest "to market." It is the retailer who "owns" the most valuable information regarding actual market demand. In repeated cycles ("days"), participants go through the motions of uncovering the daily demand, receiving shipments, preparing shipments, and making daily decisions about orders.

Computerizing the Beer Game

Board-based games have numerous limitations. The location and space involved are narrowly prescribed. Proximity to a single game board is required. Administration is a challenge, as it requires constant attention, monitoring, and calculation. At the same time, the manual administration of the game often slows it down. There have been several attempts to computerize the Beer Game. Among these attempts are at least two a-synchronous versions in the University of Indiana (http://jacobs.indiana.edu/beer) and at the University of Darmstadt in Germany (http://130.83.11.91:8080/). A synchronous version, based on a Local Area Network connectivity model was developed at the University of Michigan by Severance and Murray, as the Michigan Interactive Logistics Simulation Game (MILS).

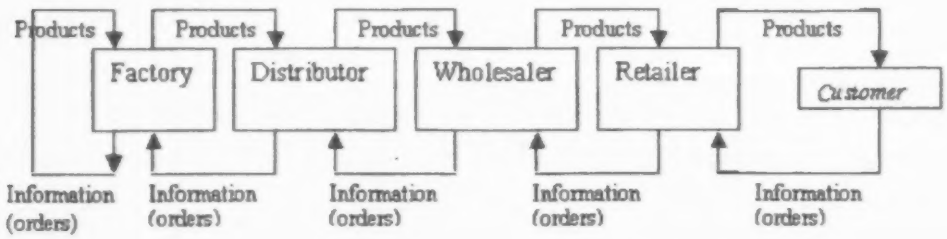

FIGURE 11
Supply Chain Topology

Our computerized version of the Beer Game is titled "Hulia" (chain-link in Hebrew). Hulia is similar to the MILS game in facilitating synchronous operation. However, Hulia is internet-based, multi-lingual and international in orientation (Rafaeli et al., 2001, 2002b; Ravid & Rafaeli, 2000). In a development beyond traditional and older online versions of the Beer Game, Hulia also allows modular and monitored online communication facilities such as email and group communication between players in a team.

The online implementation of the Beer Game allows experience, investigation, and exploration of information sharing in a team. Information sharing is, at once, a highly abstract concept and a crucial managerial skill.

As an internet-based game, Hulia helps alleviate some of the weaknesses of traditional games. Participants face a computer workstation rather than each other, making for increased realism and external validity. Administration of the game is improved as the trainers are able to monitor, audit, and control all information flows. These are recorded by the computer and available for future use. Recall that the information flows, i.e. both formal and informal messages that travel between participants, as well as numerical and graphical data requested by participants and displayed by the computer are the main point of conducting the experience in the first place. Furthermore, the content, directionality and pace of the information flows are logged and available for inspection and exploration in both real time and in retrospect, following the game.

While a manual version of the Beer Game is highly detailed, its interface is simple, and the dynamics are at a medium level of complexity. Computerizing the simulation does not change the mathematical decision model that underlies the game. Therefore the dynamic complexity is preserved, however interface complexity is increased and detail complexity is reduced.

Figure 12 displays a screen shot of the main information and activity panel. Players face this game for the larger portion of the game, and it is here that they are provided information about physical product flows, incoming demand, the progress of real and game-simulated time, etc. Players may click on tabs that replace this screen with dynamically updated numerical and graphical reports that pertain to financial, production and inventory data. An extension of the Beer Game was developed in the model displayed in Figure 13, where email and distribution options are made available to the participants.

Many thousands of students in graduate and post graduate education contexts have been involved in Beer Game simulations since the 1960s. Results of the game have been described extensively in the literature, as in Sterman (Sterman, 1989, 1992b), Senge (Senge, 1990), and Goodwin & Franklin (Goodwin & Franklin, 1994). In the traditional setup, the participant enacting the Retailer position faces a demand function that is stable save for one growth step that occurs several days into the game. Other than

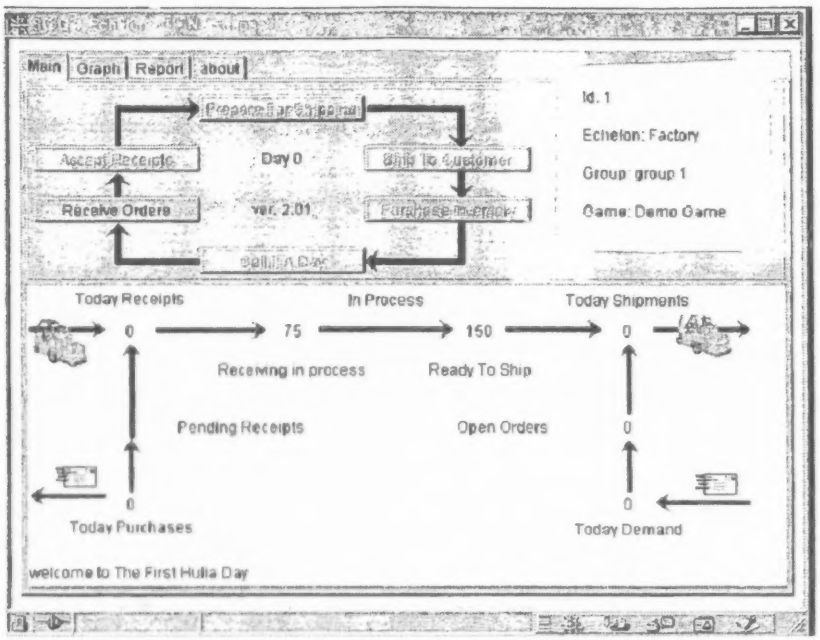

FIGURE 12
Screen Shot of the Hulia Game

that single "bump," demand remains even throughout the game. As the Retailer is the only participant who really knows the demand, the communication system within the group results in a negative feedback loop with a delay that causes fluctuations, amplification, and less than optimal decision making (Senge, 1990).

Managers and students find the simulation to be very stimulating as well as realistic. One of the main lessons picked up by managers is the impact and cyclicality of the effects of system structure. An out of control whiplash effect on inventories and the untamable chain reactions are experienced first hand.

Participants' behavior and performance in Hulia (the online version) repeats the patterns discerned in manual, board-based implementations of the Beer Game (Rafaeli et al., 2001; Rafaeli & Ravid, 2003).

The online version allows players to be located anywhere—next to each other, spread around a campus, or even located in different countries. Nevertheless we have typically used Hulia with co-located, synchronous groups. The concurrent availability of players for the game and the immediately following debriefing preserves the competitive spirit and atmosphere. Talking got their neighbors and running into other groups during the simulation allows the formation of a sense of placement vis-à-vis other groups.

The Beer game has a very simple set of simple rules. Participants are required to make one decision per game (or simulated) day. The pricing of the various resources and activities (raw materials, production, inven-

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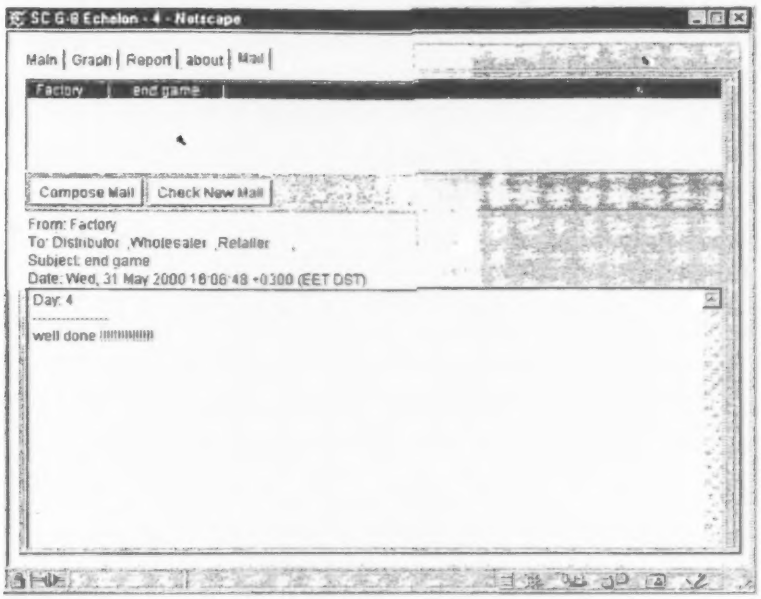
SC G-8 Echelon - 4 - Netscape
Main | Graph | Report | about | Mail |
Factory | end game
Compose Mail | Check New Mail
From: Factory
To: Distributor ,Wholesaler ,Retailer
Subject: end game
Date: Wed, 31 May 2000 16:06:48 +0300 (EET DST)
Day: 4
well done !!!!!!!!!!!!

FIGURE 13
Screen Shot of Electronic Mail Pattern

tory, shipping, etc.) is designed such that there is a theoretical chance to make a profit. Thus, participants enter the game highly confident that they face a surmountable challenge. However, participants quickly find out that task is only seemingly easy. Participants report that their sense of efficacy is rapidly brought into question by the early deterioration of business outcomes.

WHY SHOULD WE PLAY AT ALL?

Surfing the web constitutes a "pull" process. By using a browser and input devices (i.e., keyboard, mouse etc.) the surfer actively searches for the information. In contrast, "Push" modes employ different methods of receiving information: In a "push" environment, the user is passive while the provider plays a more central role. Active channels, Netcenter, and portals are a few examples of push products.

The Push vs. Pull dichotomy serves well in understanding simulations and games. Traditional, in-class board-and-chalk teaching systems are based on the "push" model. Students have little or no control in the process. Games, on the other hand, constitute a "pull" model. Here, participants are less passive, are pulled into the learning process and are encouraged to participate. Students are actual partners in determining the learning process when they use simulations and simulation-games.

Simulation and simulation-games are experiential learning processes where knowledge is created by the transformation of experience (Saunders, 1997). Usually the process is cyclic. There are six basic underlying assumptions:

1. learning is defined by the process and not by the outputs;
2. learning is based on experience;
3. learning must include conflict;
4. learning is a process of adopting a discovered "world";
5. feedback between the learner and the environment is required;
6. learning creates knowledge.

In a large survey of corporate training practices published in Training in 1994, over half of the companies whose training practices were studied were found to use simulations in their organizational training. Following are attributes of simulations that need to be considered when constructing simulations to be used in training:

- Realism: the more realistic the "game world" the more effective the simulation will be (Redfern, Fairweather, & Watson, 1996; Stumpf, Watson, & Rustogi, 1994).
- The player's experience needs to be added to the game reality (Lehaney, Kogetsidis, Platt, & Clarke, 1998; Redfern et al., 1996).

Attributes Related to the Nature of the Simulation

- Simulations enable time compression. It is possible to simulate a long, real period such as months or several business quarters in the course of only a few in-classroom minutes (Butterfield & Pendegraft, 1996; Faria & Dickinson, 1994; Filipczak, 1997; Gilgeous & D'Cruz, 1996; NSC, 1999).
- Feedback can be immediate (Faria et al., 1994; Fripp, 1997).
  - Simulations are an inexpensive training tool (Gilgeous et al., 1996).
  - Simulations can be familiar since they are well spread (Lehaney et al., 1998).
  - Realism motivates (Manzoni & Angehrn, 1998).
  - Realism adds new perspectives to uncertainty (Gilgeous et al., 1996).
  - Simplification enables focus on the main issues (Butterfield et al., 1996; Keys, Fulmer, & Stumpf, 1996).
  - Simulations permit inexpensive experimentation (Faria et al., 1994; Fripp, 1997; Gilgeous et al., 1996; NSC, 1999).

Conclusions and Lessons from Simulation-Games

- Participants make strong and stable connections between theory and reality (Manzoni et al., 1998; Redfern et al., 1996)
- Simulations teach analytical methods (Faria et al., 1994)
- Simulations provide unbiased results (Thavikulwat, 1995).
- Players tend to continue to search for relevant information, even after the game is over (Manzoni et al., 1998).
- Lessons-learned survive for longer time periods (Manzoni et al., 1998).

In the preceding sections, we described three online, internet-based simulations used in teaching managers. The applications described range from individual level, one-person tasks, through virtually simulated group activity, to real-group simulations. Common to all these simulations is the dressing of managerial dilemmas and dynamics in the guise of a fast-paced, competitive simulation. All simulations involve the interactive use of computers by participants. Furthermore, all situations expressed here evolve beyond plain and traditional business decisions. Simple business games, even computerized games, have been in use for decades. In these traditional games, the purpose was typically to simulate activity in a market situation. Here, the focus is somewhat more subtle. The situations simulated here are expressions of information predicaments faced by managers. The focus is on the information problem: how to share it, how to accept it, how to deal, sell or buy it.

The distinction between the simulations rests on the dimensions of single vs. group and competition vs. collaboration. The utility, performance, attraction, motivation, and learning in training are the declared goals of these simulations (Dowling, 1997; Gredler, 1996). Due to the subject matter and the nature of the prospective students, the popular exhortation to "tell, show, involve" (Rapert, 1981) is perhaps most apt in business education.

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CHAPTER 4

INNOVATIONS IN WEB-FORMAT CASE TEACHING Leveraging Dynamic Information

Delwyn N. Clark

MANAGEMENT EDUCATION IN THE DIGITAL ECONOMY

Moving into the digital economy, the Internet, the World Wide Web (WWW), and electronic commerce have fundamentally changed the ways businesses are organized and managed (Tapscott, Ticol, & Lowry, 2000; USDOC, 2000). What impacts have these emerging information and communication technologies had on management education? In 1997, Bilimoria (1997) warned that management educators were "in danger of becoming pedestrians on the information superhighway." Obsolescence, slowness, and constrained choice were major threats for the profession to address. She advocated changes in pedagogy to accommodate the changing nature of the knowledge creation and dissemination processes. Faster

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uptake of new technologies in new and innovative ways was proposed to improve performance of educational objectives. Aligning institutional support and reward systems was also needed to encourage pedagogical innovation and change by management educators (Bilimoria, 1997). Writing in a 1999 *Journal of Management Education* editorial, Bilimoria concluded:

> ...we stand at the threshold of a new era in which the creation and dissemination of information and knowledge will occur in remarkably new and different ways. To this point, pedagogy in management institutions has largely consisted of within-classroom, discipline-specific, and instructor-controlled information dissemination. A variety of indications suggest that advances in technology have the potential to transform these routine pedagogical practices by extending conventional spatial and temporal classroom boundaries, introducing rapidly retrievable transdisciplinary, context-sensitive, and problem-focused information, and propelling knowledge creation to students (Bilimoria, 1999: 231-232).

Calls for more learner-centered approaches to university teaching, coupled with effective integration of new technologies throughout the learning system, were previously advocated by Laurillard (1993), who also provided guidelines for implementation of these types of initiatives. Evidence of efforts by individuals and institutions throughout the education sector to respond to the challenges of information and communication technologies by adopting and experimenting with new technologies and electronic modes of learning has increased. Research to understand and evaluate the effectiveness of new technologies in management education and training programs has also grown. Several studies have focused on aspects of the design and delivery of MBA courses: Arbaugh (2000) compared virtual and physical classrooms for an MBA Strategic Management course; Miesing (1998) discussed an intensive, integrative MBA Global Business project course that was web-supported; and Human, Kilbourne, Clark, Shriberg, & Cunningham (1999) examined web-enhanced instruction in an MBA interpersonal skills course.

Research in other management disciplines includes teaching Human Resource Management via the web (Berger, 1999), evaluating Organizational Behavior learning activities for online delivery (Bigelow, 1999), and comparing electronic with face-to-face interactions in an experiential bargaining exercise (Meisel & Marx, 1999). The use of electronic student portfolios was explored in an undergraduate Management course (by Chappell & Schermerhorn, 1999); web-assisted and online courses were compared in Management communication (McEwen, 2001); and, the efficiency and effectiveness of email and the Internet as International Business Communication teaching and research tools was studied by Hilton & Kameda (1999). On a much larger scale, Alavi, Yoo, & Vogel (1997) examined how IT can enable collaborative learning and teaching with transcontinental student teams, multiple instructors, and integration of internal

expertise. Webster & Hackly (1997) studied the effectiveness of twenty-nine technology-mediated distance learning courses. In addition, Shrivastava (1999) has proposed a conceptual and operational framework to create online learning communities.

This volume of the *Research in Management Education and Development* series presents further examples of innovative types of technology-based learning products and evaluates the associated learning environments, experiences, and outcomes. Most of the initial web-based course materials from institutions, publishers, and other new entrants in the education sector, involved direct translation of *existing* courses and documents into a web-based format. For example, videos of mini-lectures, notes provided as power point slides, reading lists in electronic format, and moderated discussion sessions online (Lynch, 2002). Distance learning protocols were also readily adapted for electronic delivery (Carr-Chellman & Duchastel, 2000). To improve efficiency, educational institutions have established intranets and moved course administration processes onto the web e.g. online timetables, course outlines, grades, and electronic submission of assignments. However, the new technologies also provide considerable scope for innovation and enable *new* types of learning tools and environments to be created and developed. Finding ways to leverage dynamic information is one of the new challenges for educators and managers in the digital economy.

In this Chapter, I will outline a series of teaching innovations that address this challenge by leveraging web technologies to provide dynamism in content, delivery and learning processes. Web-format case studies represent a new innovative learning medium for management education. To establish the context for this innovation, the role of case studies in management education is briefly outlined. Details of the structure and design of web-format cases are described, and teaching applications of this new learning tool are discussed. In conclusion, the impacts and implications of these innovative web-format cases for management education are proposed.

CASE STUDIES IN MANAGEMENT EDUCATION

Case studies are fundamental for Management Education. In undergraduate, graduate, and executive programs around the globe, cases are used to illustrate contexts and concepts, while providing the basis for developing skills in analysis, decision-making, communication, and teamwork. Compelling stories of key people and the issues they face in organizations stimulate student interest and bring 'reality' into the learning environment (Naumes & Naumes, 1999; Lynn, 1999; Edelson, 1998). Management case studies typically capture and describe the issues involved with a specific

decision in an organization (Barnes, Christensen, & Hansen, 1994; Leenders & Erskine, 1989). Like a snapshot, the traditional case provides an historical record of the context at a point in time. The amount and type of information included in the written case depends upon the focal issues involved, as well as the analytical and conceptual objectives of the case (Leenders & Erskine, 1989). Accordingly, the length of a case study varies from one to forty five pages of text and exhibits.

Teaching and Learning with Cases

Harvard Business School (HBS) pioneered the innovative development of case teaching of Management starting in 1910 and published the first book of written cases in 1921. The current collection of cases written by HBS faculty and associates exceeds 7,500 case studies. Based upon the Socratic approach, Harvard's case method of teaching involves instructor facilitation of class discussions of cases, instead of lectures. Active learning is required with this teaching format as students are expected to come to class prepared and to make contributions to the unfolding case discussion (Lynn, 1999). Students practice applying specific theoretical concepts to diagnose the issues, analyze problems, generate alternatives, evaluate strategies, and prepare recommendations for action. This is a deductive learning process that is designed to develop managerial judgement and a range of critical thinking skills (Barnes et al., 1994). Cases blend cognitive and affective learning modes (Brown, Collins, & Duguid, 1989). For example, taking on the roles and responsibilities of specific decision makers is one of the ways that the learning experience is personalized (Mauffette-Leenders, Erskine, & Leenders, 1997). Barnes et al. (1994) used the fundamental principles underlying the case method to explain the power of student involvement:

> (a) a focus on understanding the specific context; (b) a sense of appropriate boundaries; (c) a sensitivity to interrelationships, the connectiveness of all organization functions and processes; (d) an examination and understanding of any administrative situation from a multidimensional point of view; (e) the accepting of personal responsibility for the solution of organizational problems; and (f) an action orientation (Lundberg et al., 2001: 456-457).

Cases simultaneously achieve multiple learning objectives. According to Mauffette-Leenders et al. (1997: 5-6) eight different types of skills are developed by case teaching, including:

1. analytical,
2. decision making,

3. application,
4. oral communication,
5. time management,
6. interpersonal/social,
7. creative, and
8. written communication skills.

Beyond class discussions, cases may be used for assessed coursework including individual or group written assignments and presentations. Local, national and international case competitions have been established by many institutions to build bridges with corporations and provide a forum for students to extend and test their skills.

Availability and Distribution of Teaching Cases

Following the lead set by HBS faculty, cases have become an essential pedagogical tool in all management disciplines. They are widely used in courses teaching any subject from introductory accounting through to integrative strategic management. Instructors can choose cases from Case Collections administered by publishing divisions of major institutions that have specialized in case research and writing. Beyond HBS, the Richard Ivey School of Business Administration at the University of Western Ontario (Canada) has the second largest collection with an active list of 2000 cases and 200 new cases produced every year. Darden Graduate School of Business, at the University of Virginia, also has a large collection of 3,810 cases and produces 160 new cases each year. The Kennedy School of Government at Harvard University has 1600 active cases, with 50 new cases added each year. Other universities with major case collections include: London Business School, IMD (Switzerland), INSEAD (France), IESE (Spain), Stanford University, and the University of Hong Kong.

In addition to these institutional collections, there are Case Clearing Houses in many countries to distribute cases and provide publication outlets for local cases. The European Case Clearing House (ECCH), based at Cranfield University in the United Kingdom, has the largest collection and also distributes cases from all of the major Case Collections. ECCH recently established a new online database for management cases and reprints (called COLIS) that has very quickly grown to include over 4,300 cases available for online inspection.

Cases are also reviewed and published in some academic journals, including the specialist *Case Research Journal* (published by the North American Case Research Association, NACRA), *Entrepreneurship, Theory and Practice* (includes only entrepreneurship focused cases) and the new electronic *Management Case Study Journal* (published online by the University of South

Australia, www.mcsj.unisa.edu.au). In addition, teaching cases appear in textbooks (both 'off the shelf' and customized versions) and in discipline-specific casebooks.

INNOVATIVE WEB-FORMAT CASE STUDIES

Technology enables educators to create new and innovative electronic case studies with many different formats and a variety of extra features. For example, introducing media and adding interactive web functions to cases dramatically changes their form and function. By increasing dynamism in both the content and delivery of cases, students are provided with new and different learning experiences. These changes also increase the range of learning objectives that can be achieved with this case tool in management education (Groves & Zemal, 2000; Lynch, 2002; Mason, 1998). For example, developing information management skills (Eddy Spicer, 2000) or technological literacy can become explicitly stated outcomes with this style of case.

Written text-based cases (prepared with word processing software) can be provided online with supplementary resources/features including images, video clips, audio files, and/or links to websites (Hall, 1999). Alternatively, web-format cases are designed and created as web documents in hypertext language using software such as Microsoft FrontPage or DreamWeaver. These web cases, which incorporate a range of additional media, animation, and interactivity, are viewed through a web browser such as Internet Explorer or Netscape. There are several styles of web-format cases available commercially with different names (used inconsistently by different institutions) including multimedia cases (in which video dominates), hypermedia cases (containing hypertext and multimedia), interactive cases, Internet, and web cases. Distribution of web-format cases occurs either using a CD, or via the web with access by password to the documents located on the host institution's server.

Web-format cases are a relatively new learning tool in management education. Only forty-seven web cases were listed in all of the major Case Collections in August 2002; although many other web cases have been developed in-house for specific courses by enterprising academics and/or their students. In the commercial arena, the Darden Case Collection had sixteen multimedia cases in the subject areas of strategy, marketing, organizational behavior, finance, and e-business (Christmann, Faris, Pfeifer, Harder, & Lehmbeck, 2001). The European Case Clearing House had eighteen multimedia cases listed in their COLIS database, predominantly in productions/operations. The authors of these cases were from a number of European institutions, including: Bocconi University Management School (Milan), Copenhagen Business School, ESADE (Barcelona), Nor-

wegian School of Business and Economics, Rotterdam School of Management, Stockholm School of Economics, University of Cologne (Germany). A further two Internet-based cases have been developed in Europe by staff at the International Institute for Management Development (IMD, Switzerland) (ECCHO, 2001). In addition, the Kennedy School of Government at Harvard University listed sixteen media cases in their case catalogue of which five were web-based cases, and the Harvard Business School Case Collection had six multimedia cases listed in their Interactive Resources section at this time.

Video has been widely used as a supplementary teaching material for many years. From experience at the Darden School, Liedtka (2001) has outlined the issues associated with creating and teaching with 'stand-alone' video cases in which the heart of the case is presented in video format. Naumes & Naumes (1999) also considered the benefits and problems associated with the video case format, and Richardson & Kile (1999) have examined video case applications within teacher education. Experience with the development of multimedia format cases has been reported from the Kennedy School (Eddy Spicer, 2000) and the Darden School (ECCHO, 2000; Christmann, Faris, Pfeifer, Harder, & Lehmbeck, 2001). Research projects to enhance the learning outcomes of multimedia cases have been conducted. For example, the impacts of technological architectures have been examined by Schank (1993, 1998, 2002) and his colleagues (Schank, Korcuska, & Jona, 1995). In this chapter, the focus will be on web-format cases that incorporate hypertext links and a variety of media.

Teaching and Learning with Web-Format Cases

Electronic case studies can be used to achieve any, or all, of the learning objectives generally associated with traditional written cases, outlined above. In addition, new objectives can be achieved with the introduction of novel formats, new features, and extra functionality (detailed in the next section). For example, web-format cases provide a new learning medium for the development of process skills and abilities. This is a timely addition to the tertiary educators toolkit, as the transient nature of information moves their focus from content knowledge towards process skills and abilities (Dolence & Norris, 1995). As summarized by Drucker (1993), "In the knowledge society people have to learn how to learn... subjects matter less than the student's capacity for continuous learning." In their review of management education, Pratt & Davey (2000) acknowledge that "Knowledge navigation becomes more important than knowing, learning how to learn in a rapidly changing environment becomes more important than 'facts'; process skills and abilities become more important than product."

Web-format cases can provide management educators with a substitute for a traditional paper case. This maintains the status quo in terms of the case teaching and learning processes adopted, but potentially enriches the student experience with the additional features included within the web-format case. For example, providing 'immediacy' of access to information, on-going events, and people, places, and processes (Eddy Spicer, 2000) increases the types of information provided within the case. Increasing dynamism in the teaching materials adds to the scope or richness of the information, increases complexity and enhances the 'holistic' learning experience provided for students. These outcomes align with expectations of traditional case method teaching (Barnes et al, 1994; Lynn, 1999).

Alternatively, web-format cases have the potential to provide management educators with new pedagogical tools that give students a variety of new and different learning experiences. In this mode, web-format cases respond to the educational challenges raised by Bilimoria (1999) and others, such as Laurillard (1994), providing a technology-based innovation that has the potential to change teaching methods and learning processes. For example, including web cases in coursework places greater emphasis on learners' as these cases require greater interaction and involvement with the case material (Naumes & Naumes, 1999). As the content of web-format cases is dynamic, students are enabled to study companies in their environmental context, and to simultaneously examine multiple perspectives. As the structure of web-format cases is variable, students choose from multiple paths through the case material, instead of following a fixed, sequential route. These types of differences in content, delivery mode, and learning styles are significant. Extending case content from a static, independent narrative, to an experiential, interactive web-format product, removes the traditional separation between case content and the case teaching/learning process. With this new case format, the boundaries between case material and case teaching methods are blurred[1]. As the learner assumes a more active role in the overall process, the locus of control for the learning process moves away from the instructor towards the student.

In addition to providing the basis for instructor-moderated class discussions, web-format cases can be used for a range of individual or group assessments. As the size and complexity of these types of cases varies markedly, instructors need to choose cases, or design and build their own, according to the learning objectives of each course. The cases can be analyzed in class or online, using only the questions in the case or by following course protocols. In executive education programs, web cases can also be used for workshop-style classes, course assessment, or with a time-restricted case exam format. For example, I used a strategy case on WoolNet (an electronic marketplace for New Zealand wool) with an Executive MBA class as a case exam, allowing six hours to analyze and prepare a presentation on

their strategic analysis, issues, and recommendations for senior management (assessed by a panel of judges).

An innovative approach involves students in designing and building their own web-format cases. This is a challenging research exercise that I have used as an optional team project in a third year strategy paper (for strategy majors and electronic commerce students) in 2001 and 2002. Using a series of web-format cases throughout the course, provided exposure to this style of case. Students use many different types of skills in this novel assignment, including knowledge of course theories (to accurately represent relevant content and issues in their case), company research abilities (to find and evaluate key information), technological competencies (to design and build an effective website), effective electronic communication (to describe the company in this electronic medium), and interpersonal skills (to work efficiently with other team members). In addition to providing an interesting learning experience, this assignment also created a valuable resource for the Department. In 2001, eleven of the eighteen teams in the course opted to develop a web case, and fourteen out of sixteen teams enthusiastically tackled this assignment in 2002, providing an archive of new web cases that can be used (with some editing and revisions) for coursework and assessment in this paper in future years. Figure 1 shows one page of a student team case on an Internet banking business called Fastnet.

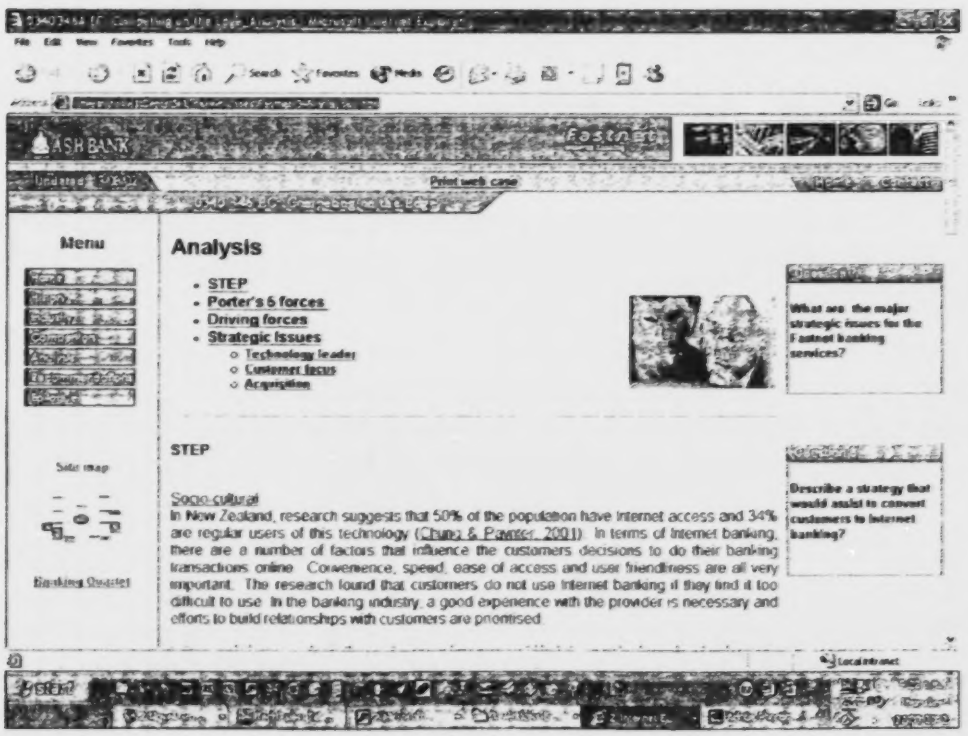
Menu
Analysis
STEP
Porter's 5 forces
Driving forces
Strategic Issues
Technology leader
Customer focus
Acquisition
What are the major strategic issues for the Fastnet banking services?
STEP
Socio-cultural
In New Zealand, research suggests that 50% of the population have Internet access and 34% are regular users of this technology (Chung & Paynter, 2001). In terms of Internet banking, there are a number of factors that influence the customers decisions to do their banking transactions online. Convenience, speed, ease of access and user friendliness are all very important. The research found that customers do not use Internet banking if they find it too difficult to use. In the banking industry, a good experience with the provider is necessary and efforts to build relationships with customers are prioritised.
Describe a strategy that would assist to convert customers to Internet banking?

FIGURE 1
Sample Web-Format Case Study © 2002 Waikato Management School

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In another innovative application of web-format cases, I have used them as the building blocks of a modular online management course. This is a unique second-year undergraduate course, focusing on understanding the dynamic context of business and developing a set of fundamental/core management skills and abilities. The web templates developed as the architecture for this course are expected to be able to be adapted quite readily for further online papers in future. This paper thereby provides a *prototype format* for developing management skills and understanding the context of business. This format seems appropriate for skill building in lower level undergraduate papers and has appeal for the new generation of students raised with computers and video games. It provides an alternative to the discussion-based online course format. Using web-format cases enhances the development of both technological and information literacy which are key competencies for managers in the digital economy.

Design of Web-format Cases

Moving from text-only to web-format cases changes the case preparation process. The addition of graphics, hyperlinks, and interactivity, significantly increases the options available for the layout of every page. Beyond case research and writing expertise, preparation of web-format cases also needs web design and web building skills. In this section key topics involved in the design of web-format cases will be outlined including the structure and page layout options, visual formats and types of additional functionality. Note: This section is primarily based on my experimentation in the development of a series of case studies for a third-year Strategy course at Waikato Management School.

Structure and Page Layout Design

The overall structure and page layout of a traditional written case study is not a major design issue as standard text conventions are implicitly followed. The case story is outlined in text with a linear and sequential layout. Descriptive headings signal major topics from the beginning (introduction), through the body of the case, to the end (Leenders & Erskine, 1989). Pagination is based on complete/full pages of text. However, there are many more issues to be explicitly incorporated into the design of the structure and layout of web-format cases. A web case has an introductory 'home page,' with some instructions to explain the objectives and content of the case. As there may be multiple paths through a case (non-linear structure), navigation menus and buttons are used to guide the reader through the case. There are many different options for the layout of web pages as illustrated in Figure 2. The newspaper or grid style of website with multiple columns of text and images has been popularized by leading

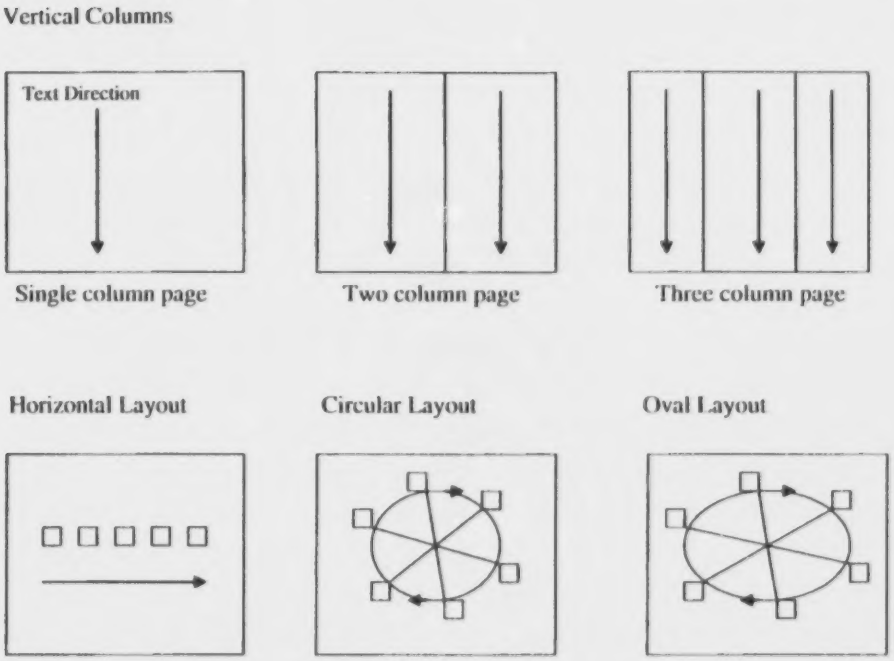

FIGURE 2
Page Design Layout Options

e-tailers (Amazon.com; e-Bay). This columnar grid layout is supported by website design research (summarized by Hall, 1999) that short lines are much easier to read on screen and learning is more effective "with more shorter lines, than with fewer longer lines." As reading on screen is much slower than reading on paper, text segments need to be kept small and concise. Writing the case in short segments with supporting graphics helps to maintain student interest and also assists with pagination of the case. Page length on the web is influenced by several factors including monitor size, screen display settings, resolution, reading requirements, and font size (Lynch, 2002: 83). To provide consistency in the layout and appearance throughout the case, a web page template is prepared using a cascading style sheet defining the fonts and size of content text, colors, background style, and graphics for headers and navigation (Greenlaw & Hepp, 1999).

As alternatives to the vertical columnar layout, web-format cases can be designed with major sections/modules hypertext linked from an introductory home page. Theme cases have an original design reflecting the major topic involved e.g. a chronological case can be laid out horizontally as a timeline, or a stakeholder case can be designed as an oval or circular network. Game-styled cases can be designed in almost any creative format and page layout e.g. using symbols such as keys, doors, tunnels, or snakes and ladders.

Visual Formats

Web cases include visual elements and media to supplement text as an integral part of the case design. *Graphics* that can be used to directly support the text includes images (animated or still), diagrams (e.g. processes), pictures (e.g. products or buildings), photographs (e.g. key people), or graphs (e.g. industry statistics, or the company's financial performance, or market share trends). Website instructional research concludes that graphics should be used "carefully and only when necessary" (Hall, 1999) to add the richness needed to achieve the desired educational objectives. Too many images and excessive movement from animated graphics can be distracting and annoying (Mathew & Dohery-Poirier, 2000). Designing web pages to avoid "clutter" and not contain too much information is advised (DeBra, 2002, Greenlaw & Hepp, 1999). Further support for limiting graphics is more pragmatic—based upon the need to minimize download time for external users dependent upon modem access (Greenlaw & Hepp, 1999).

Multimedia options include using streaming video clips, SMIL presentations, and audio recordings to provide specific details for the case. To view and listen to these multimedia segments requires a sound player, such as Windows Media Player or Real Player. Extra plug-ins are also needed to view other dynamic media including Macromedia Flash and Shockwave. Provision and updating of specific supporting technologies for multimedia is an institutional decision linked to Information Technology and e-Learning policies. However, to get the best effect from the media components of cases, students need access to the appropriate versions of all the software and plug-ins. For example, Darden's multimedia 'Enron 1986-2001' case, which features videos from key executives who worked for the company, requires Macromedia Flash and Windows Media Player 7. Interestingly, Darden's research found that 96% of web users could view Flash (Christmann, Faris, Pfeifer, Harder, & Lehmbeck, 2001).

Hyperlinks can be used to connect to documents within the case or to link beyond the case to external sites. These links enable access to the vast resources on the web and provide the basis for an extremely broad range of directed interactive tasks. This is a distinctive feature of web-based cases that utilizes the potential of the Internet and differentiates these cases from traditional static paper-based teaching materials. The web provides opportunities for new case formats that are live and interactive—taking the student on a guided path to examine topics of interest by linking directly to websites, company documents, media reports, and questions for reflection and analysis. Rather than studying historic case materials, this approach enables students to study companies and their activities 'as they are happening' and to develop awareness of the context of business.

Functionality

With different structures and a range of extra features, web-format cases have additional functionality not found in traditional written case studies. *Navigation* is added to guide the reader through the various sections of the web case. Website designers add click-on menus as horizontal and/or vertical margins (frames) to enable direct movement through a site (Greenlaw & Hepp, 1999). Menus are color-coded and customized for each case with specific keywords for the major section headings. To enable continuous flow through the case, buttons are also provided at the bottom of each page that link forward (next screen), backward (previous screen), to the top (of the current page), and home (front page).

Instructions to assist the learner with the web case are also provided. These may include an introductory overview with learning objectives, details on navigation, technology specifications, descriptions of customized icons, and a site map illustrating the overall case architecture. Contact information for academic and technical support, and Frequently Answered Questions (FAQ), may also be included with the case instructions. Links to the Institution's online course management infrastructure can be used to enable online conversations about the case, online submission of assessment, or access to other system resources/capabilities.

To increase understanding and skill development, *questions* are included within each web-format case. These can be inserted as rollover or pop-up style questions within sections of text to prompt the leaner to reflect upon specific concepts (e.g. in introductory management cases). Quiz style questions in multi-choice or short-answer format can be included to test understanding of specific case content. Generic and/or specific questions to guide student reflection, research, and analysis, can also be included depending upon the objectives of the case and the course. For example, in their interactive, web-based, recruitment interview training case, Boston Consulting Group (BCG) uses questions in a novel way to guide analysis of a company (BCG, 2003).

Having a *print* function within the case appeals to many students with work habits and visual preferences for reading hard/paper copies. However, the direct connectivity of the hyperlinks is missing if these cases are not studied online. Providing a print option for some segments of a web case offers a compromise position/solution.

An *epilogue* section, which can be used to update and extend the current content of a web case, provides extra functionality. Links to search engines, additional company and industry websites, media archives, or topic-related forums, enable students to find and incorporate new information that is not already covered in the case. These links extend the scope and timeliness of the case study. However, to prevent students getting information overload or 'lost in hyperspace,' guidelines need to be provided for these search activities (DeBra, 2002; Fornaciari & Roca, 1999).

Design Processes, Problems, and Solutions

Given all of the extra features and dimensions involved in the design of web-format cases, an iterative design process is required to produce an effective case. In particular, testing the prototype case is needed to ensure that all of the hyperlinks work. As websites and archives may not stay 'live' permanently, it may be necessary to archive essential material (with permission). Faculty and students appear to have greater expectations for timeliness of web cases (Eddy Spicer, 2000). Extending the "shelf life" of these dynamic cases and reducing the risk of obsolescence is also important for case developers, given the resources involved in their preparation. An iterative process has also been found to be appropriate for developing effective assignments for hypermedia cases (Eddy Spicer, 2000).

Effective learning with web-format cases requires a clear alignment with specific objectives and learning goals of the course. When introducing these new format cases for the first time, students need an 'orientation' to the distinctive features of the case structure and content (Eddy Spicer, 2000). As explained above, each web-format case incorporates an introduction section that includes instructions for using the case. Providing a 'careful framing of the assignment' is an essential step in the learning process with web-format cases (Eddy Spicer, 2000).

Collecting student feedback on their experiences with each case is important for making improvements to their content and design. I included a short set of questions with each web-format case assignment and conducted focus groups upon completion of the course. One of the key design issues for a non-linear web case is determining the size of the case. Student feedback that is useful here includes the time spent on the case, and their recommendations for addition and/or deletion of specific material. Decisions on the graphics and levels of animation are important characteristics of a web case. Student feedback on these design features, although subjective, is particularly helpful for refining the overall 'professional' image of the case, and to identify issues for access from external sites. Another pragmatic issue for students links to the assessment weighing of individual case assignments. I discovered from student feedback that they preferred to have a higher coursework weighing for a smaller number of web-format cases and made this change in subsequent offerings of this course.

IMPLICATIONS FOR MANAGEMENT EDUCATION

Web-format case studies represent a new innovative learning medium for management education. Beyond the educational issues already outlined, what are the impacts and implications of this style of case study for students, educators, institutions, and other educational sector stakeholders?

As an alternative form of case-based learning, web cases potentially expand the range of options for learning activities within courses and extend the types of active learning experiences available to offer students. As student learning styles and preferences vary, providing extra variety in the total package of learning experiences creates value (Lynch, 2002:16-17). In addition to developing skills such as technological literacy and knowledge management, web-format cases can be used in innovative ways to provide the basis for collaborative (Mason, 1998; Murphy & Cifuentes, 2001) or personalised learning activities (Martinez & Bunderson, 2000). In the corporate training arena, web-based instructional knowledge products can be extended to include cases that develop analytical and research skills (Bonk, 2002). This web-format can provide the architecture for development of new online and distance education courses.

As with other online learning activities, one of the advantages of web-based cases for students is the increased flexibility to work online whenever they want (frequency, timing, and duration) (Mathew & Dohery-Poirier, 2000; Nikolova & Collis, 1998). However, specific compatible software (e.g. web browser and media player) and operating systems (e.g. IBM) may be required to view these cases from off-campus locations.

Adoption of new instructional technology is influenced by many factors including equipment availability, ease of use, time needed to learn, and availability of training (Groves & Zemel, 2000). These factors are relevant for management educators considering the introduction of web-format case studies. According to a recent study of online teaching, the main obstacle to using the web in teaching was preparation time (Bonk, 2001). For example, following multiple paths through non-linear cases to become familiar with a new web-format case can be very time-consuming (Eddy Spicer, 2000). However, there is also a need for educators to extend their own competencies and develop new skills in order to use or create web-based teaching materials (Bonk, 2001; Passmore, 2000). Other related issues of concern for academic staff include workload, remuneration, and recognition in promotion decisions (Bonk, 2001; Passmore, 2000).

Institutional requirements for web-based learning include provision of the computing infrastructure and courseware systems for online courses, security, and back-up systems, computer labs for students, technical support services for staff and students, training, and instructional design support (Bonk, 2001; Lynch, 2002; Richardson, Ford, & Slovensky Nir Menachemi, 2001). Establishing policies and guidelines for server and client hardware and software within the organization provides internal standards and consistency. However, these technologies also need to integrate seamlessly with the electronic learning tools available in the commercial market. Funding to ensure regular upgrading of technology is also important to enable continuous and effective use of web-based teaching tools. Institutional support and encouragement of innovation in web teaching, backed up with development funds for experimentation, appears critical

for both initiation and successful implementation of online learning (Bonk, 2001; Bonk, 2002; Passmore, 2000). As an example of institutional support, the Dean at the Darden School introduced a revenue sharing incentive system for faculty who create multimedia cases (ECCHO, 2000).

The adoption of web-format cases in management education in future will be influenced by a number of other factors including authorship, availability, and costs. The combination of educational, research, and technological skills required to prepare web-format cases suggests a team approach to designing and developing these cases. Will academic staff be able to obtain the resources and incentives required to prepare customized web-format cases for each of their courses? Or, will this new educational product be championed primarily by the educational publishers and distributed through existing Case Collections, as with traditional case studies? Does the technological-based architecture of the product, create new market opportunities for other types of providers e.g. computer services specialists, instructional training and development companies, e-learning specialists, or new partnerships or consortia?

As signaled by Bilimoria (1997, 1999), advances in technology provide challenges and opportunities for management educators to introduce dynamic information and create new learning tools. Web-format cases have been proposed as an innovative learning medium that can leverage the potential of the web to provide active student leaning in a wide range of customized programs. Dynamic and interactive formats significantly extend the potential learning objectives for case-based teaching. Rather than waiting for the commercial market to develop, encouraging students to design and build these web-format cases provides an immediate path forward. By adopting this new approach, management educators will be 'riding the fast lane along the information superhighway.'

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NOTE

1. This distinction was pointed out by one of the anonymous reviewers.

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CHAPTER 5

ELECTRONIC STUDENT PORTFOLIOS IN MANAGEMENT EDUCATION

David S. Chappell and John R. Schermerhorn, Jr.

There is great potential for integrating Electronic Student Portfolios, or "ESPs," into management courses and curricula. This chapter introduces the student portfolio concept as a learning resource, with special attention to its use in the electronic or on-line form. An illustrative case of the development of ESP uses in one institution is presented to highlight the possibilities and implementation issues that were encountered. An annotated bibliography is included that highlights recent research into the use of portfolios in a variety of educational areas.

The student portfolio is quickly becoming recognized as an important means of documenting and evaluating achievements and improvements in student learning. Technology has magnified this role to enable departmental, programmatic, and campus-wide assessment of student learning to occur (Kaufman & Jafari, 2002).

The student portfolio is a compendium in print or electronic format that communicates the academic accomplishments and professional resume of

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a student. While now experiencing a modest growth in popularity in collegiate settings (Williams and Hall, 1997; Yancey, 1992), the history and most common use of student portfolios in higher education has historically been concentrated in the education and the fine arts disciplines (Ryan and Carlton, 1997; Schindler, 1997; Slater, 1997). More recently student portfolio use is extending into a broader variety of settings in higher education, with the website of the American Association of Higher Education providing an excellent listing of institutions that are using portfolios. The growing interest in student portfolios indicates awareness of their innovative potential as an educational resource that can help stimulate and document student learning outcomes, as well as enhance the presentations of student credentials to potential internship sponsors and employers (see Appendix A). Those experimenting with student portfolio programs presently include faculty from the fields of business and management, where a variety of initiatives have been launched to integrate them into courses and curricula (Chappell & Schermerhorn, 1999; Pool, 2001; Rooney & Rea, 2002; Schindler, 1997).

The continued mainstreaming of computer and information technology in university education (Luke, 1999; Lorange, 2002) has been accompanied by a new and rich portfolio opportunity. *Electronic Student Portfolios*, or ESPs, that are electronically created and stored on-line are now joining the traditional "hard copy" portfolios in use at some campuses (Campbell, 1996; Chappell & Schermerhorn, 1999; Wall & Peltier, 1996). About the opportunities represented by ESPs, the Portfolio Coordinator at Western Michigan University, Jo Cornell, says:

> They provide students an opportunity to present, through a progressive and dominant communication system, their abilities, knowledge and attitudes by incorporating materials created in classes, through activities, and on their own volition. They provide those who access the materials an interactive opportunity to experience unique, creative 'three-dimensional' individuals (Kaufman & Jafari, 2002).

The purpose of this chapter is to review the elements of the Electronic Student Portfolio concept in the context of technology-enriched management education. The chapter examines the literature for insights from research and practice, and offers suggestions gained from the authors' personal experiences with ESPs. Special attention is given to an illustrative case involving attempts to integrate Electronic Student Portfolios into an introductory management course, into an undergraduate management major, and into the general curriculum of a college of business. To highlight the present state of the concept an annotated bibliography of selected highlights from the growing literature on student portfolios is included as *Appendix A*. Pr..ctical guidelines, including potential pitfalls and concerns, are offered for those interested in pursuing the multiple

opportunities and advantages of using ESPs in management courses and academic programs.

STUDENT PORTFOLIOS IN MANAGEMENT EDUCATION

Management educators work today with great commitment in a time of change, challenge, and opportunity. We also work in an institutional environment complicated by almost continuous external criticism and calls for reform from a variety of external stakeholders (Carnegie Foundation for the Advancement of Teaching, 1998; Crainer & Dearlove, 1999), and from internal concerns raised as well by the community of business and management scholars (Cheit, 1985; Leavitt, 1987; Porter & McKibben, 1988; AACSB, 2002; Pfeffer & Fong, 2002). The foundation for the change environment in which we work and learn was largely set in the 1980s with the timely work of Porter & McKibben (1988). Coming at a time when management education was at risk of complacency, this work identified the demands of a new and dynamic environment and pushed forward agendas of change. Critiques of business and management education (AACSB, 2002; Pfeffer & Fong, 2002) and its leadership (Lorange, 2002) continue to drive and inform the many innovations and new directions that are characteristic of our profession today.

In at least partial response to the calls for innovation, change, and relevancy in management education, a major development over the past decade or more has been increased attention to skills/competency development and outcome assessment in academic programs. These themes remain central to the accreditation approach by AACSB International—The Association to Advance Collegiate Schools of Business. They are also central to the notion of professional business and management education with the goals of career readiness and life-long learning capabilities for students. It is in this context that the potential advantages of student portfolios in general and ESPs in particular offer special value as integrative learning tools that are both career focused and skills and competency driven.

What is a Student Portfolio?

Student portfolios can best be thought of in respect to the large black "portfolios" that students of art and graphic design use to carry and display samples of their work. When asked by someone to show their talents and accomplishments, the student merely opens the portfolio and reveals actual samples of his or her work. The samples can be shown sequentially

and thematically. They can be displayed through the portfolio in a context that allows the viewer to understand how the individual's art and accomplishments have developed and changed and grown over time to their present state, and how they vary in respect to range and diversity of approaches and capabilities. In short, the portfolio allows for "real" and "face-to-face" presentation of one's skills and competencies and accomplishments in a full developmental context.

The potential exists for similar benefits and outcomes when the traditional "art/graphic design" portfolio notion is extended elsewhere in academic curricula, from use by students in the arts and sciences to those in business and engineering, and more. As applied to this full range of potential settings, Chappell & Schermerhorn (1999: 652) formally define the student portfolio as a "compendium of materials that document and demonstrate a person's accomplishments and career readiness." A sample of additional and related definitions is provided in Table 1. A review of the table shows common agreement on the concept and further introduces basic character elements of the student portfolio concept—including such

TABLE 1
Alternative Definitions of "Student Portfolio"

Bernhardt, Cole and Ryan, 1993	"...a collection of a student's work that focuses on education, self-development, and career information as it relates to short- and long-term planning"
Gillespie, Ford, Gillespie and Leavell, 1996	"...a purposeful, multidimensional process of collecting evidence that illustrates a student's accomplishments, efforts, and progress (utilizing a variety of authentic evidence) over time. The collection should include evidence and accompanying explanations indicative of the student's active participation throughout the development of the portfolio"
LeMahieu, Eresh, and Wallace, 1992	"...portfolios are not merely archives of students' products. Rather, the portfolio activity ... is a process of production, perception, selection, and reflection that is exercised by each student over his or her entire body of schoolwork"
Powell and Jankovich, 1998	"...a compilation of papers that represent the quality of one's work"
Schindler, 1997	"...a collection of evidence of skills and accomplishments presented in an order and format to achieve a particular objective"
Shackelford, 1996	"...a purposeful collection of materials capable of communicating student interests, abilities, progress, and accomplishments in a given area"

descriptors as documentary, self-reflection, authentic, longitudinal in nature, engagement, experiential, and integrative.

Student Portfolio Types and Purposes

In a discussion of student portfolios, Shackelford (1996) sets forth a taxonomy that identifies four "types" of portfolios, each of which serves a slightly different purpose. The four portfolio types are:

1. *Showcase portfolios*—document a student's highest quality or best work only; there is no attempt to provide evaluation or assessment.
2. *Descriptive, or "works-in-progress" portfolios*—assess, but do not evaluate, a student's progress. They are most useful in identifying student's strengths and weaknesses.
3. *Evaluative, or "record-keeping portfolios"*—document measurable skills and abilities and record student mastery of specific understandings. Reflection and self-assessment on the part of students are an important component of this approach.
4. *Composite portfolios*—focus on group work, including the group's efforts, progress, and accomplishments.

Shackelford suggests that the portfolio's purpose should drive its content, with the alternatives carefully selected to serve the intended purpose. In respect to purpose, the typical student portfolio in the management education context is or would be multifaceted, including at the individual level the first three of Shackelford's types.

There is an important "evaluative" purpose to be served by student portfolios, beginning with the opportunity for the portfolio to act as an assessment tool throughout the student's academic career. As a student progresses through the curriculum, the portfolio depicts the progress made in acquiring the skills and competencies necessary to be successful in life. In this developmental context, the portfolio serves a "descriptive" purpose, focusing attention on strengths, weaknesses, and developmental possibilities. As a student progresses through a program the portfolio can and should reflect increasing sophistication with more and more elaborate examples of "accomplishments" and "capabilities" being represented in the portfolio. As a descriptive and evaluative tool the portfolio acts to benefit both the student and the faculty. It facilitates outcome assessment by faculty, course/program planning by faculty, and personal/professional development planning by students. Ultimately, the individual student portfolio evolves into a "showcase" that becomes an effective career tool. In this role it offers to potential employers, internship sponsors, and others spe-

cial insights into the students' accomplishments and capabilities that go far beyond information contained in the standard resume.

Benefits of Student Portfolios

The potential benefits of student portfolios are multifaceted. These benefits are evident even though actual formal evaluation studies of portfolio programs are few and most published material is descriptive and/or case driven (see Appendix A). Among the benefits most commonly recognized for student portfolios are serving:

1. student learning motivation and interests,
2. faculty outcome assessment and curriculum interests, and
3. administrative operational and strategic interests.

Student Learning Motivation and Interests

The common ground of performance accomplishment among the various approaches to student portfolios is creating a capability for students to display efficiently and effectively their individual resumes, career goals, academic accomplishments, and overall career readiness (Carlson & Youngblut, 1998). This display capability serves two main purposes: (1) the advancement of students' career interests through communication with external stakeholders, and (2) enhanced behavioral self-management and learning motivation for personal development on the student's part.

Well-developed portfolios can be used to advance the student's interests with a variety of important stakeholders (Carnegie Foundation for the Advancement of Teaching, 1998). From the students' vantage points, these stakeholders of interest include:

a. advisors and instructors interested in academic assessments,
b. employers offering potential internships and full-time jobs,
c. parents who are often paying the bills, and even
d. other students searching for benchmarks and role models.

With the portfolio serving as a "frame" or "structure" within which students' accomplishments can be captured and documented for these stakeholders, the filling in or completion of the portfolio becomes a "goal" or "target" that is or should be motivational to the student. The portfolio becomes, in this sense, an immediate and visible depiction of one's accomplishments to date, as well as an indicator of work yet to be accomplished. Thus, portfolios become important as templates offering stretch goals and performance feedback that can be helpful to the students themselves for

self-management, reinforcement, motivation, and personal development planning. By using a portfolio, students will hopefully find added desire to strengthen their strong career orientation and emphasize learning outcomes within their academic programs (Magill & Herden, 1998). Overall, portfolios stimulate and require student reflection and encourage more active participation by students in their own learning and the assessment of its outcomes.

Faculty Outcome Assessment and Curriculum Interests

Portfolios are viewed as particularly useful in documenting students' progress and accomplishments in their academic programs, something that is both well recognized in management education and is important to the AACSB's accreditation process. This includes playing a role in assessing hard-to-measure skills, including problem solving, human relation skills, team building, leadership, effective communication skills, and especially integrated knowledge across the curriculum (Pool, 2001; Slater, 1997). The portfolio serves as an integrating platform that brings together in one place a variety of documentation that can be directly assessed vis-à-vis learning outcomes specified for specific courses and for integrated curricula.

Faculty benefits to portfolio usage derive from both their product and process sides (Shackelford, 1996). As a product, portfolios provide results and outcome documentation that is much richer than a mere educational transcript. It supports a deeper representation of student capabilities within a defined area of expertise and program of academic study. As a process, the function of portfolio building includes production, selection, performance, and reflection. This process forces students to accept responsibility for their own work. This notion recognizes the importance of portfolios as an instructional tool, rather than just as a record of various program outcomes (LeMahieu, Eresh, & Wallace, 1992).

If the purpose of good assessment is to inform instruction (Gillespie, Ford, Gillespie and Leavell, 1996, p. 480), then portfolios offer a valuable addition to the evaluation process. However, portfolios are not in themselves a complete or adequate response to the assessment challenge (Penta, 2002). They must be utilized as one resource that becomes part of a broader assessment package, reinforced by faculty commitments.

Administrative Operational and Strategic Interests

Educational leadership is concerned with a diverse variety of external stakeholders (Leavitt, 1987; Mowday, 1997; Lorange, 2002). The portfolio provides concrete and measurable evidence of the attainment of academic objectives of interest to different stakeholder groups. Accreditation agencies, central administration, alumni, parents, state legislatures—all share an interest in the effective use of increasingly scarce academic resources (Dillon, 1997; Elshtain, 1998). The portfolio acts to "package" the total

academic experience in a concise and organized fashion that encourages a more systematic examination of educational outcomes. When students in an academic program utilize portfolios the strategic interests of administration vis-à-vis these stakeholder groups can be advanced. This occurs not only with the increased visibility of student accomplishments in their eyes, but also with the increased professionalism and career orientation among students.

Promoting students with potential employers to enhance job placement internship programs is an important and essential goal of all academic programs. Portfolios, both paper and electronic, serve as valuable complements to the standard resume available to employers (Powell & Jankovich, 1998). Students are better able to distribute their credentials to interested parties through the use of the Internet-based materials. When portfolios are in use, students should find it easier to pursue their career interests in respect to initial internships and first-job placements. By supporting portfolio programs administrators can enhance their career development and placement work in behalf of students, while simultaneously helping to further relationships with not only existing business constituencies but also newer ones developed through contacts with the portfolio program.

BENCHMARKING ESP PROGRAMS FOR APPLICATIONS IN MANAGEMENT EDUCATION

The Electronic Student Portfolio or ESP takes the standard student portfolio and puts it online for dissemination and viewing through the Internet. When extended into a formal ESP program, for a course, major or even program, the ESP is a perfect fit with efforts to mainstream technology into business and management education. It offers many opportunities to familiarize students with the full-range of technology's personal and professional advantages (Alavi, Yoo, & Vogel, 1997; Bilmoria, 1997; Chappell & Schermerhorn, 1999; Cytron, 1998; Frand & Broesamle, 1996; Gandz, 1997; Magill & Herden, 1998). Many institutions are pursuing these benefits of ESPs, along with others.

Benchmarking

As mentioned earlier, the most complete listing of existing portfolio programs is provided on the website of the American Association for Higher Education, AAHE (see: http://aahe.ital.utexas.edu/electronicportfolios/). Formerly compiled by Kalamazoo College, the list includes 51 institutions that presently promote some type of portfolio process

within their academic curricula. Some 85% of these programs in the AAHE database make use of the Internet as the primary form of development and distribution, suggesting that the "E-portfolio" approach is quickly becoming the norm. Most programs are based on an online resume of the student along with writing examples of the individual. Well in evidence is a trend toward greater sophistication in regard to the technology support infrastructure provided with the programs. Instructions, technical assistance, examples, and promotional support provide a greater level of standardization with student outcomes. The bulk of the ESP programs concentrate on either student reflection or student evaluation. Consistent with Shackelford's (1996) argument that a portfolio's purpose should drive its content, they exhibit a variety of outcome objectives: advising (4%), student evaluation (25%), reflection (35%), career planning (16%), and institutional assessment (20%).

Two programs stand out as benchmarks for those interested in developing a portfolio system: (1) Kalamazoo College (http://www.kzoo.edu/pfolio/) and (2) Indiana University—Purdue at Indianapolis (http://www.imir.iupui.edu/iupuifolio/). The program at Kalamazoo College is one of the oldest and most comprehensive and served as an early model for later programs. The institution emphasizes reflection as one of its primary goals, with eight required "gateway" points—ranging from a "Foundations Essay" prior to freshman orientation to the final "Seniors Connections" manuscript. The listing of objectives shown in Table 2 for the Kalamazoo program serves as a valuable benchmark for others. It rep-

TABLE 2
Highlights of Kalamazoo College ESP Program

Benefits to Students	*Benefits to Advisors*
• Understand and articulate your educational experiences	• Raise important questions with advisees
• See the connections between the disparate parts of a "K" education	• Know more about students majoring, minoring or participating in their disciplines
• Collect your significant academic and experiential work in one place	• Write more informed letters of recommendation
• Develop long-term goals and plans that give coherence and direction to your education	• Assess and improve programs and curricula
• Achieve greater academic success	• Demonstrate benefits of liberal learning
• Learn Web design	• Do what we do better

Source: Developed from Kalamazoo College website at http://www.kzoo.edu/pfolio/benefits.html.

resents one of the most ambitious, comprehensive and long-standing portfolio approaches.

Exhibiting the trend of a more intensive support infrastructure, the Kalamazoo College program provides online assistance, portfolio consultants, computer help desk, and workshops to assist with portfolio development. Among the examples of materials included in students' portfolio are: Outstanding papers, lab reports, oral presentations; photos from study abroad; reflections on important relationships; symposia or conference presentations; experiential educational activities (service learning, campus organizations); application essays for leadership positions; self-assessments by athletes and coaches; and, an Integrative Cultural Research Paper. Also noteworthy is that the Kalamazoo College program utilizes the portfolio for the entire academic experience of the student, in contrast to a single class or project-specific approach. It is now more common for schools to introduce the portfolio concept immediately as the student enters, with increasingly sophisticated additions to the folio then made as the student progresses through their degree process.

Another benchmark is found at Indiana University—Purdue University Indianapolis (IUPUI). Part of a six-school collaboration under the Urban Universities Portfolio Project (see http://www.imir.iupui.edu/portfolio/), the project seeks to integrate the portfolio approach into the core academic mission. IUPUI uses portfolios in support of institutional accreditation efforts, with application to accreditation self-study initiatives. Portfolios are also recognized as sources of valuable information for external constituents, including alumni, the local community, peer institutions, and others.

ESP Opportunities in Management Education

There is no doubt that an ESP program offers a unique opportunity to extend technology utilization in a new and valuable direction for management education. The step from traditional to on-line or electronic student portfolios is replete with advantages (Mayers, 1996; Purves, 1996; Treadwell, Leach, Kellar, Lewis, & Mittan, 1998; Wall & Peltier, 1996). In a user-friendly and user-relevant context, the ESP offers a way of advancing computer literacy across the full range of students, from business to non-business majors, while incorporating a broad array of further benefits. Importantly, as instruction moves from a static paper environment to an electronic one, more real-time and dynamic interaction among student and instructor is encouraged. Given the worldwide reach of the Internet, the use of ESP opens further opportunities for academic program extensions involving international collaboration and virtual teamwork (Atwong, Lange, Doak, & Aijo, 1996; Chappell & Schermerhorn, 1999).

The electronic dimension of student portfolios also improves and facilitates the distribution of the portfolio to various constituent groups. Students should experience improved motivation and career awareness with the realization that their portfolio is readily accessible to potential employers. When a portfolio is available on-line or in electronic form, potential employers have the added advantage of being able to "interview" students by distance, either replacing the initial campus face-to-face interview or preceding it. This helps expand the pool of potential employers for a business school, building the potential base of employment and internship opportunities for students, helps to build and cement preferred contacts with external executives, and helps demonstrate to these constituencies a level of sophistication in technology utilization that reflects positively on the academic program and its students.

At a time when technology becomes increasingly important, the electronic portfolio clearly provides a platform of broad value to management education, ranging from immediate impact on students' learning and career potential all the way to an impact on faculty capacities to build and implement integrative curricula. But in order to ultimately and fully tap the potential of ESPs in management education, the approach must be supported by a high level of institutional and faculty commitment and coordination—much more so than does the more traditional paper portfolio approach. ESPs face the classic challenges of adoption and diffusion common to technological innovations in other institutional settings (see for example, Rogers, 1995; Orlikowski & Hofman, 1999). Their intuitive appeal and value does not guarantee interest or use. While extolling the virtues of electronic student portfolios, for example, Jeffrey Young (2002) adds this caveat for consideration: "Many administrators say that e-portfolios will be the next big thing in campus computing, although others wonder how many students will want to use them, and how many professors will embrace the idea."

EVOLUTION OF AN ESP PROGRAM IN MANAGEMENT EDUCATION: ILLUSTRATIVE CASE

An Electronic Student Portfolio program was started four years ago in the management department of the College of Business at Ohio University. It was launched with the support of a small grant designed to promote improved technology utilization in instruction. Both authors of this chapter were involved in this initiative, and our work with ESPs began as a component in our introductory management course. Based on that experience, the ESP was shared with others in the college and subsequently became used in an introductory business seminar required of all first-year College of Business majors, in selective MBA courses, and by

some students in other programs on campus. It has been engaged at the college level as part of a comprehensive effort by the specialized internship and job placement service to expand its impact with students and potential employers. Within the management department, the ESP was integrated as a formal requirement when the major was recently revised. Students now maintain their ESPs throughout the required courses and submit a final portfolio summarizing their work within the major.

ESP Phase I: The Introductory Management Course

Our initial goals in the experiment to incorporate the ESP into the introductory management course (taught in a variety of section sizes from 40 –300) were multiple and varied. It gave us a way of integrating technology utilization into the course, even when taught in very large sections. It offered a way of bringing a "career readiness" theme to the course, encouraging students to focus on how learning activities and assignments offered personal and professional development opportunities. It was also a way to help students easily communicate with internship sponsors and potential employers. The ESP requirement was justified as follows in the course syllabus:

1. *The ESP serves as an academic assessment tool.* As a student progresses through the curriculum, the portfolio allows systematic documentation of progress and development made in fulfilling academic program requirements and in acquiring important career skills and competencies.
2. *The ESP is a career development tool.* The ESP requires the creation and maintenance of an up-to-date personal resume. This resume is a reminder to the student of career development needs and a ready means of communicating one's potential to prospective employers. Because the ESP contains additional easy-to-access information, it also helps inform prospective employers beyond the traditional resume limitations.

The ESP Template

The basic components of our ESP, as with any, is a template or front page containing links to other folio elements. For example, the main portfolio page shown in Figure 1 contains a professional-style graphic interface that clearly identifies the student with

a. Ohio University, the College of Business and a major program of study,
b. offers the student's full name and contact e-mail address, and

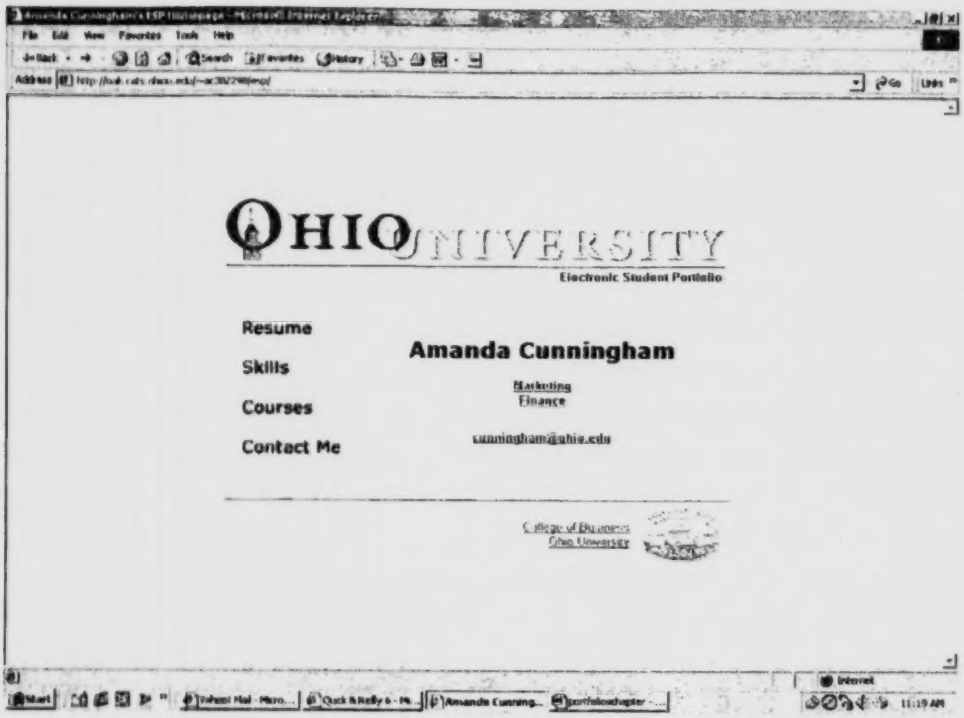

FIGURE 1
Sample ESP Front Page

c. contains button links directing the reader to major subsections that in this case contain a resume, coursework and skills pages.

The actual content of the ESP template can easily be adjusted according to programmatic needs and decisions. Indeed, our approach has changed over time. Through experience we have modified the template, striving to find what was most useful and informative in our setting. What has remained consistent in our approach, however, is a commitment to a standard front-page design that is required of all students. This was done to promote a highly professional approach to the ESP by the students and ensure that communication through the ESP to external audiences was also framed in a professional interface. We have also insisted that the resume be in a standard format for similar reasons. Beyond that, however, our approach has intentionally been flexible in regard to the portfolio's content.

Student Use of the ESP

From the beginning of our work with student portfolios, it was intended that students take an active role in deciding how to best portray themselves

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and their accomplishments in their ESPs. We experimented over time by structuring their approach by offering the following "button" options from the main page: Coursework, Skills, Student Life, Interview, Personal Pages, and Resume. Ultimately, trial and error led us to simply the approach to just three portfolio sections—resume, courses, and skills. The intent is to broadly focus the student and cause them to make choices to convey useful information in each section. This includes, for example, details on a program of study, academic accomplishments and related competencies, and personal/professional extra-curricular development activities.

A collage showing sample supporting pages from students' ESPs is shown in Figure 2. We expect students to use their ESPs to file and submit various assignments specific to the introductory management course, but also to accumulate the best of these along with ones from other courses to further refine their ESPs to show to potential employers as actual examples of their learning and capabilities. In the management course, for example, students typically provide in the ESP on-line examples of their completed executive memos, individual and team projects, Internet research, Power Point presentations, and more.

Those students who adopted the ESP for purposes beyond the management course, we found that many of their content choices reflected their

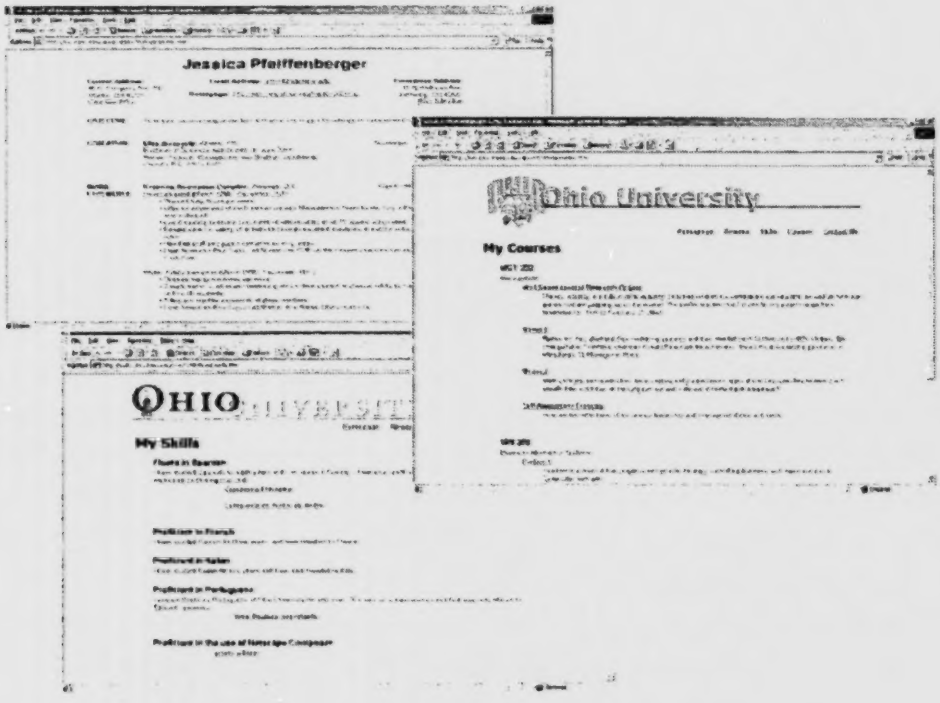

FIGURE 2
Sample ESP Supporting Pages

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special interests, capabilities, and imaginative natures. Results of work on individual and group research projects, individual memos, spreadsheet analyses, business plans, and other such activities are very common. The following are selected examples.

- An osteopathic medicine student developed an online, interactive case that required medical students to diagnose an ailment. The file contained pictures, a description of symptoms, diagnostic options, and treatments.
- A physics student included an application for a National Science Foundation grant for molecular research.
- A health and human services administration major included a summer internship project involving a business plan for a hospital expansion in Tennessee.
- A marketing major included examples of her work as the editor of an electronic company newsletter from her summer internship.
- A business student with a minor in French provided an example of a writing sample in French to demonstrate her capabilities for potential international business assignments.

ESP Phase II: Academic Program Extensions

One started, we found that the ESP approach offered great potential for application to other courses, majors, and programs. In terms of extensions, our ESP initiative has been extended as integral to the newly-revised management major, it has received some support as a launch platform for introductory business students, and has received some consideration as a broader program for bringing incoming freshman to campus with a commitment to technology utilization in learning.

ESPs Integrated in the Management Major

After our course-specific experiment in the introductory management course proved successful, it was decided to extend the electronic student portfolios into an outcome assessment program within the management major as a whole. At the time we were revising the major and it was believed that the portfolio concept could be integrated into the new curriculum. The design now has students building their ESPs step-by-step through their junior and senior year sequence of major-area courses. Each required course, in turn, is supposed to be responsible for covering a certain "outcome assessment" area of the ESP. In this way the students add to the folio further accomplishments and competencies as they are acquired while moving through the courses in a building block approach.

The ESP is an integrating mechanism and "capture point" for outcome assessment in this new curriculum model. In our faculty discussions it quickly emerged as a ready and easy base for both formative and summative evaluation of student accomplishments. By design students are supposed to review their ESPs with faculty advisors at regular intervals, and to both discuss and ensure satisfactory progress in key learning outcomes. By the final quarter of the senior year, students must register for a one-credit module in which they polish the portfolio to create a final "graduation" version of the ESP for presentation to a panel of department faculty. Presently, this new curriculum and approach with the integrated ESPs is under initial trial and implementation.

ESPs in the Introduction to Business Experience

In a spill-over initiative, the ESP caught the attention of the Assistant Dean for Student Affairs in our college. He included it in an introductory seminar required of all freshman business students. The first author was included in the seminar schedule and introduced the ESP as part of the seminar. Students were required to establish their personal ESP front pages and to electronically add a first attempt at a college-level resume. While many students found the resume particularly frustrating, the idea was to get them to start thinking about what they wanted it to look like upon graduation.

Importantly, the freshman students were also shown examples of more complete resumes of juniors and seniors from the management course. Ones were chosen for display that students had used successfully for internships and job placements. This provided a form of ESP "role model" for their future development of resumes and for using the college opportunities to full advantage in building their ESPs to similar stages of excellence. It is our impression that many students find the ESP role models insightful and motivating as they venture forward from the freshman experience.

ESPs in Other Applications

Within the college there is now momentum building to include the ESP as a required "integrator" for student accomplishments and outcome assessment at the level of the junior core courses. In addition, there has been discussion about moving the initial assignment of building an ESP into the "pre-college" orientation experience, one that takes place during the summer preceding the arrival of new freshman to campus. It has even been suggested that all incoming students be required to have their ESP front page up and running, and with a writing sample posted, by the first day of class in the introductory seminar. This would be a way to demonstrate their commitment to technology utilization and serious professional

development through business studies in their forthcoming university experience.

ESP Phase III: Internship and Career Placement Applications

One of our primary goals in starting the ESP program in our courses was to create documentation that students could use to advance their success in internship and job search activities. This process begins with the ESP acting as a framework and capture point for a professional resume, course work samples, and other examples of career-relevant competencies. Students then use this on their own initiative to communicate with external audiences for career purposes.

It soon became apparent to us, however, that the multiple ESPs maintained by students can be managed as a database and made available by a unit or college to potential internship sponsors and employers. Thus we began another experiment, building with college support a searchable database of electronic portfolios. The purpose was to allow employers to conduct online searches of student ESPs (in particular, their resumes) based on key search terms. For example, an employer with database access (given by the college upon registration) would be able to search and review ESPs on various sorting criteria—major, grade point average, student activities, etc.

Although the pilot database was created, the utilization by employers proved disappointing. Most employers expressed little or no front-end concern with in-depth documentation that indicated proficiencies in students' college-level work. They were most interested in the resume as a screening tool (even thought the rest of the information was literally only a "click" away). More significant, perhaps, they seemed more comfortable collecting the resumes in person or in career fairs than over the Web.

Our reluctant acceptance of this employer disinterest caused us to both abandon further investments in the searchable database and to readjust the use of the ESPs by our students. For on-campus and in-person interview settings, they are now encouraged, for interview purposes, to print the ESP to create a "show-case" paper portfolio that can be presented and even left with the interviewer. Employers, while not always interested in the individual documents, do seem impressed that students are interested enough in their own professional development to create and organize such a collection of their academic work and over collegiate experience.

Of course we still encourage students to actively pursue use of the electronic portfolio approach when communicating with potential employers, especially those who do not or are unlikely to visit our campus. In one case, for example, a student had sent a letter of inquiry to a potential employer along with a paper resume. The employer called and during the conversa-

tion the student mentioned that more extensive material was available in her online ESP. During the telephone conversation the employer opened the website and reviewed with the student the ESP materials. She was so impressed that the student was immediately offered the opportunity to visit the firm for a formal interview.

ESP Outcomes and Results

The prior example is but one of many that we consider to be ESP success stories. Our experience with the ESP in our setting has been very favorable, consistent with the suggestions of the broader literature. We have had to modify our approach as we gained experience with it and we have had some positive extensions over time. The success in the introductory management course is clear and we believe that the ESP approach will play a valuable role in the new management major. We are hopeful that use of the ESPs will extend further in our college curriculum and, ideally, into the larger university setting. We also remain convinced that ESPs, whether in pure online form or as the basis for "show-case" paper portfolios, are helpful to students seeking internships and full-time job offers. Comments such as these have made our efforts with the ESP program very worthwhile.

> I had an interview with a company called ... The interview was for an internship position this summer. Well I went in and after looking over my resume for the second time (I had previously emailed it to her) she asked me all of two questions MAYBE. For some reason or another I mentioned my portfolio and pulled it out to show her. Her reaction was wonderful. She was impressed by how organized I was and how focused I was on what I wanted to do. After looking over the portfolio and a small amount of discussion over it she offered me the internship on the spot! So if you want to know how the portfolio worked out...one word: amazingly!

> Anyway I just wanted to thank you for introducing me to the web and HTML programming. I was a television/film/communications major who had little experience with computers beyond Excel and Word. Originally, I despised the electronic student portfolio, it was probably the most frustrating assignment I'd ever had in college, but after finishing it, I discovered that I actually enjoyed myself and was also pretty good at it. At Ohio University, I worked on a news website through journalism that I helped update on a daily basis. We had top-of-the-line equipment and were able to put video and audio on the web. I also built a site by myself for a club that I was a member of. The point is, I now have my dream job at .. . They hired me based on my television/web experience. I'm a production assistant for the online department, which has given me the opportunity to work on some of the top sites in the industry.

I recently received many job offers and was able to choose the best one for me, in part this was due to the visual aid of my work that I brought with me to my interviews. This visual aid was the ESP that you had encouraged your management students to do last year. I completed and enhanced my version before starting my job search and I was very pleased with the comments I received when showing my ESP to prospective employers. I would just like to thank you for planting the seed that helped me attain my goal of finding a job that fit myself, my goals, and my lifestyle the best.

...during the interview, the director of West Coast Sales was very, very impressed with the portfolio book that I made because of your strong suggestion .. thanks. He said he liked it because it proves that I 'think outside the box'.

IMPLEMENTATION ISSUES IN AN ESP PROGRAM

Table 3 offers advice on where on the Web one can find useful information on ESPs. In addition, our experience suggests two implementation issues that should be considered by others who are considering similar initiatives

TABLE 3
Where to Go for Advice on ESPs

www.essdack.org/port/	Helpful steps on starting an electronic portfolio system in elementary schools
www.electronicportfolios.com/	Development of electronic portfolios for all ages
www.ed.gov/databases/ERIC_Digests/ed390377.html	Arguments in favor of portfolios
www.aahe.ital.utexas.edu/electronicportfolios/	Electronic portfolio resources for higher education
www.uvm.edu/~jmorris/portresources.html	Web sources for electronic portfolios
www.edweb.sdsu.edu/courses/edtec596r/students/Abrenica/Abrenica.html	Benefits of electronic portfolios
www.eduscapes.com/tap/topic82.htm	Links to online portfolios
www.hcob.wmich.edu/portfolio/	Portfolio project at Western Michigan University
www.kzoo.edu/pfolio/	Portfolio program at Kalamazoo College; includes portfolio bibliography and database of schools using portfolios
www.imir.iupui.edu/portfolio/lessons.htm	Suggestions to start a portfolio project

with electronic portfolio programs—technology support and faculty champions.

Technology Support for ESPs

Technology support is critical from both student and faculty perspectives. In our case, Ohio University students are provided substantial and free Web space on the university's main computer system. This system becomes the host for all student ESPs. Our ESP templates are accessed from a special website that had to be developed. This site has evolved over time, but provides all the essential instructions that students need to build and maintain the ESPs on their own. We have also found it useful to provide links to other helpful sites, including sample ESPs, frequently asked questions and answers, an online HTML tutorial, and links to additional career resources on campus.

In our experience, the existence and continued refinement of the online support is critical to the ESP program. Our original Web-based instructions turned out to be sorely inadequate. We found that students' computer literacy varied immensely, for both business and non-business majors. As we encountered problems, we found it necessary to significantly rewrite and expand the on-line instructions to include specific step-by-step instructions for the portfolio infrastructure. Student problems were multiple and varied, including: confusion over computer terminology, failure to grasp the difference between a local computer and a Web server, and failure to take the time to read the directions.

A "tech support" service is also essential. The course instructor cannot serve in this capacity, at least not for very long or in very large section settings, without becoming overwhelmed. We were fortunate to have grant money available to hire student assistants, undergraduate management information system majors, who contributed in many ways to the program's implementation, as well as design and continued development. Student workers were scheduled to provide technical assistance during designated hours at our main computer laboratory's help desk. However, we always held fast to the requirement that the primary responsibility for learning the necessary competencies of ESP development fell onto the students themselves. Student workers were instructed to provide only consulting assistance and not to build the ESPs for others. Our intention was to locate responsibility for learning with the student, and to have the development of the initial ESP be in part a problem solving experience. With this approach, the students eventually learned to become their own Webmasters—responsible for the look, content, and maintenance of their ESP Websites.

Faculty ESP Champions

Although we report considerable success with our ESP program within the management course and major, its extension into the college as a whole has been limited to date. The initiative remains promising, but incomplete... still in process. Even though the course structure exists for all incoming freshman to build an initial ESP, these portfolios are largely not subsequently utilized or reinforced by faculty outside of the management department. Many faculty don't really know the details; some lack of interest; others have the awareness and interest but are scared by perceived "technology complications."

It is essential and necessary to have faculty champions associated with any broad-based ESP program, even at the departmental or multiple-section course levels. Many professors are reluctant to commit time and energy into a comprehensive exercise that requires so much up-front investment in time and resources. Efforts must be made to introduce portfolios both formally and informally over an extended period of time, and including "internal selling" among college faculty and administrators, not just students.

Important questions can be raised regarding our performance as product "champions." Although we did fine in our course and department, and although we worked with the freshman introductory experience and launched the trial placement database, we did not do well in communicating the program more broadly throughout the college. That performance shortfall is being corrected, hopefully, as a new initiative is underway with the support of the Associate Dean for Academic Affairs to further redesign the ESP template and supporting technology platform, as well as to use the ESP to integrate the junior-level core curriculum. This new project seems very promising and may be poised to receive broader backing from the faculty at large.

Finally, the departure of the first author for a position at another university created an additional problem for our ESP program—one with lessons attached for others who embark on ESP initiatives. In our case, the original concept was his and he joined with the second author to create the initial ESP experiment in the introductory management course. From that point on the partnership continued as the ESP program was further developed and various extensions pursued. However, and very importantly, the programming knowledge and technology leadership remained his province. At the time, this distribution of roles was logical and comfortable, reflecting different competencies and interests. With his departure for a new career opportunity, however, the cost of this specialization was clear. His absence left a void that proved difficult to fill. Our resulting "catch-up" called for extra efforts and special commitments by those involved in the portfolio program. For some, it may even have raised the commitment as

they faced the potential of the program's loss or diminishment. An important lesson we learned is that not only are faculty ESP champions essential, the role of champion should be broadly distributed.

CONCLUSION: GETTING THE MOST FROM ESPS IN MANAGEMENT EDUCATION

In addition to the prior thoughts based upon our experience with an ESP project at our institution, Table 4 offers an interesting and helpful array of suggestions. Called "The Baker's Dozen" and specifically focused on "electronic" portfolios, it is offered by Borden and Thomas (2001).

Our experience with development of an ESP program confirmed for us the great potential of this resource for advancing management education. At first we saw the advantages as largely course specific—improving the introductory management course. We quickly found that the advantages

TABLE 4
A Baker's Dozen Suggestions for Electronic Portfolio Projects

1.	It is difficult to establish a priori commonalities (e.g., using common templates or commonly prescribed development methods) in an electronic portfolio development project given the diverse nature of participants and the novelty of the electronic portfolio concept. However, commonalities can emerge from a post hoc analysis, especially if the participants share experiences as they proceed.
2.	Electronic portfolios have many different potential uses and can be approached with many different strategic focuses. Articulating purpose and strategic approach early in the process are essential to a successful development effort.
3.	There is no substitute for the strong commitment of campus leadership. This is particularly important for an electronic portfolio project, where the concept is not well known, and a significant amount of cooperation is required from other members of the campus community.
4.	Electronic portfolio development efforts that 'fit' well into existing program and administrative unit responsibilities will proceed quickly, but may then be limited by the existing programs and units' roles in the institution. It is probably best to combine existing operations with some new 'thinking,' as the UUPP enabled through the Project Director/IR office linkage.
5.	Involving a broad base of campus constituents increases the likelihood that the project will be supported and useful. At the same time it tends to create burdensome expectations. The best approach may be to incorporate a broad vision, while taking modest, incremental steps in scope and involvement.

(*continued*)

TABLE 4
Continued

6.	Electronic portfolios require substantial assessment capability, but they also help produce that capability. There is a span of capability within which electronic portfolio projects can best operate. If too early, the processes may not be sufficient to sustain portfolio development. If too late, the processes may be too entrenched to benefit from the insights that portfolio development provide regarding communication to external audiences.
7.	It doesn't take much hardware to develop a few electronic portfolios (e.g., institutional portfolios) in great depth. However, it takes a lot to develop many portfolios, even if each one is rather small.
8.	The development of electronic portfolios benefits greatly from ties to the institution's operational information systems, but these ties come at great costs, especially since so many colleges and universities are in the process of migrating their operational information systems. These ties are often best served through secondary data access systems, such as data warehouses.
9.	There is no one right answer about which tools to use. The tools selected should be ones that have solid support on the local campus, perhaps the ones that are established as official standards by the campus IT department or the Web policy committee, or the tools that have become unofficial standards because they are used by the team that is responsible for creating and maintaining the university's official pages.
10.	Electronic portfolio development projects are best approached with independent resources that do not have to rely on central IT time and attention. Outsourcing works if and when you can find a third-party developer who listens well and is prepared to go through many iterations.
11.	It is hard, but necessary to draw clear lines between electronic portfolio projects and other related campus technology initiatives, such as the campus Web site, or the migration to a new operational information system. Ultimately these projects may converge, that determination should be made after the portfolio project has time to take shape in it's own right.
12.	It is difficult, if not impossible, to approach electronic portfolio as a 'marginal' project, that is, by adding responsibilities to already busy faculty and staff. However, the resource requirements can be quite variables, leading to...
13.	Electronic portfolio development is like a gas: it will occupy any volume it is provided.

Source: Developed from Borden, Victor and Thomas, Timothy. 2001. A baker's dozen lessons learned about what it takes to develop and sustain electronic portfolios for program and institutional assessment, AAHE Assessment Conference, Denver, Colorado, June 26, 2001, http://www.imir.iupui.edu/portfolio/lessons.htm.

easily extended into the integration of outcome assessment and a career focus throughout a new management curriculum. We were intrigued by the great potential of ESPs to foster student career awareness and facilitate their internship and job searches, and we still believe in their potential to do so. We remain interested also in the possibility of promoting students' ESPs institutionally through databases made available to business constituencies and other important stakeholders. And even as we struggle now with ESP challenges in now different institutional homes, we together remember and gain continued motivation from this comment of an Executive Advisory Board member after listening to our first proposal to initiate the program at Ohio University: "Why," he said, "would any student who was a College of Business major not jump on this as an opportunity for self-development and career promotion?"

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APPENDIX A: ANNOTATED BIBLIOGRAPHY

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Offers 13 "lessons" derived from a functional needs assessment for the Urban Universities Portfolio Project (http://www.imir.iupui.edu/portfolio). Although the Urban Project did not specify electronic formats at first, it became obvious that the Web format was a necessary component of a flexible program.

Campbell, J. (1996). Electronic portfolios: A five-year history. *Computers and Composition, 13*, 185-194.

Chronicles the use of electronic portfolios at Conestoga Elementary School to provide historical compilations of student work. System stored both two-dimensional (writing samples) and three-dimensional (video) records of students.

Carlson, M. & Yungblut, L. H. (November, 1998). Where the wild papers are: Producing a student portfolio in the undergraduate seminar, *The History Teacher, 32*(1) 43-56.

Project emphasized student use of analytical and reflective thought in the preparation of a research methods seminar portfolio. Desire by the department for "multiple measures" encouraged the development of a portfolio approach to supplement present evaluation methods. Emphasis is on writing, historical analysis, and primary document evaluation, all skills required in higher-level coursework in the field.

Chappell, D. S. & Schermerhorn, Jr., J. (1999). Using electronic student portfolios in management education: A stakeholder perspective, *Journal of Management Education, 23*(6): 651-662.

Taking a stakeholder approach, the article identifies various groups interested in electronic student portfolio development, including students, faculty, administrators, parents, accreditation agencies, and employers. The article traces the development of a portfolio system at a university setting, complete with suggestions for improvement for schools interested in such programs.

Dillon, T. W. (March, 1997). Corporate advisory boards, portfolio assessment, and business and technical writing program development. *Business Communication Quarterly*, 41-58.

Identifies portfolios as an effective assessment technique and encourages the use of outside, community partners in assessing student performance. Emphasizes the use of portfolios for self-evaluation by the students in addition to a more complete picture of a student's best work over time.

Gillespie, C. S., Ford, K. L., Gillespie, R. D. & Leavell, A. G. (March, 1996). Portfolio assessment: Some questions, some answers, some recommendations. *Journal of Adolescent & Adult Literacy, 39*(6), 480-491.

Excellent review article on portfolios. Identifies benefits of the use of portfolios for both student participants and teachers. Student benefits include reflection, the facilitation of students' understanding of relationships between reading, writing and thinking, collaboration between students through peer evaluation, assumption of responsibility of learning by students, and development of positive attitudes toward learning. Teachers benefit from a more meaningful picture of student growth, instructional data, integration of instruction, and the answer to what constitutes high-quality work. The greatest weakness to portfolios is the increased workload for the teacher.

LeMahieu, P., Eresh, J., & Wallace, R. (December, 1992). Using student portfolios for a public accounting. *The School Administrator, 49*(11), 8-15.

Examines portfolios as a means of encouraging school reform. Emphasizes the importance of engagement on the part of both students and instructors in the portfolio process. Identifies three dimensions, including (1) accomplishment in writing, (2) use of resources, processes, and strategies for writing, and (3) engagement, growth, and development as a writer.

Penta, M. Winter, (2002). Student portfolios in a standardized world, *Kappa Delta Pi Record, 38*(2), 77-81.

Discusses implementation of an electronic portfolio system in the Wake County Public School System in North Carolina. Identifies both benefits and problems encountered in developing the program. The article concludes that "it takes a mechanism as difficult—but potentially as beneficial—as portfolios to reflect the scope and depth of quality instructional programs in a school."

Pool, S. W. March, (2001). Designing and measuring educational outcomes utilizing student portfolios for business management education, *Journal of Instructional Psychology, 28*(1), 50-58.

In response to the request for tangible proof that business schools prepare students for a competitive marketplace, the author argues in favor of instituting student portfolios. Empirical investigation supports the improvement of student scores on a TQM assignment. The article concludes that "student portfolios enhance the business curriculum; and they are an innovative instructional and assessment tool in measuring educational outcomes of business students".

Powell, K. S. & Jankovich, J. L. (December, 1998). Student portfolios: A tool to enhance the traditional job search, *Business Communication Quarterly, 61*(4), 72-82.

Emphasizes the use of student portfolios for support of the job search process. Portfolios should identify each student's goals and provide evidence that they possess the skills and qualities to meet these goals. Argues in favor

of using a variety of media, including paper, videotape, and compact disk. Provides guidance for educational institutions contemplating the adoption of portfolios in regard to content, participation, and assessment.

Rooney, P. and Rea, A. (2002). People, prose, and processors: The Haworth College of Business electronic portfolio project, *Mid-American Journal of Business, 16*(1), 39-49.

Presents the development of a portfolio program at Western Michigan University. The article offers key issues that should be contemplated prior to the adoption of a portfolio program on a large scale. Web page can be accessed at http://www.hcob.wmich.edu/portfolio/.

Schindler, P. (1997). The portfolio interview for management positions, *Journal of Career Planning and Employment,* (Winter), 41-46.

An excellent source for determining the contents for a student portfolio in the business field. Author provides surveys identifying needed business competencies, including business knowledge, oral and written communication, teamwork, problem solving, and time management. The author identifies specific areas of portfolio assistance in the job interview process, including the portfolio as a "professional crutch" and as adding a "visual dimension" to the resume.

Shackelford, R. L. (1996). A process/product learning and assessment strategy, *The Technology Teacher,* (May/June), 31-36.

Provides excellent overview of the portfolio concept. Argues that the process of portfolio development is more important than the final product in that portfolio production is a powerful instrument for enhancing learning. Views student portfolios as an instructional process that fosters active learning, collaboration, interdisciplinary activities, reflection and self-assessment, community involvement, and the development of identified foundation and workplace skills.

Slater, T. F. (1997). The effectiveness of portfolio assessments in science. *Journal of College Science Teaching,* (March/April), 315-318.

Argues that portfolios strategies encourage use of longer, more complex, and authentic student assessments. Argues that whereas multiple-choice tests determine what the student doesn't know, portfolio assessment emphasizes what the student does know. Acknowledges that portfolios shift much of the responsibility for learning and assessment from the professor to the student. Offers quantitative and qualitative evaluation of portfolio system.

Wall, B. & Peltier, R. (1996). "Going public" with electronic portfolios: Audience, community, and the terms of student ownership. *Computers and Composition, 13,* 207-217.

Documents the experience of two teachers using student portfolios to encourage student responsibility in writing at Trinity College. The electronic format motivated students to more readily accept "peer review" from colleagues in a more constructive manner. Writing "online" differed substantially from writing for oneself.

Wolf, K. & Siu-Runyan, Y. (September, 1996). Portfolio purposes and possibilities. *Journal of Adolescent & Adult Literacy. 40*(1), 30-37.

Argues that the purpose of keeping a portfolio ultimately determines its form. Self-assessment portfolios will differ from those meant for statewide evaluation of student performance. Identifies the aim of a portfolio is to advance student learning in a collaborative environment. Introduces three portfolio models (ownership, feedback, and accountability) and presents their strengths and limitations.

CHAPTER 6

THE PLACE AND SPACE MODEL™ OF DISTRIBUTED LEARNING
Enriching the Corporate e-Learning Model

John Gallagher

INTRODUCTION: INFORMATION OR PEOPLE?

The Internet brings a fundamentally new way to access both *information* and *people*. That is, the Internet is both a new *distribution channel* and a new *communications channel*. Although these views are both interesting, which is *more* interesting? In a way, the question is a type of Rorschach test. Underlying the choice are beliefs about the fundamental nature of learning and the role of training and development.

The promise of the Internet to improve the distribution of information has dominated the early applications of corporate e-learning. Today, most corporate e-learning applications are grounded in this view. Clearly, these content-focused applications promise significant and well understood ben-

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efits such as modularity, efficiency, cost, just-in-time delivery, and the like. As important as these applications are, they only represent a subset of the larger opportunity. This chapter expands the framework for e-learning by placing greater emphasis on social and human-interactive aspects of learning and technology.

When we characterize the Internet primarily as an information access and distribution channel, we see a world populated by "content providers" who can reach remote audiences with "interactive" and "adaptive materials" from "leading subject matter experts." "Education consumers" can access these materials at any time and from any place. This has given birth to the ubiquitous phrase "learning on demand."

Of course, this view extends a long line of earlier efforts at one-to-many instructional technologies such as computer-based training, videodisks, instructional television, audiotapes, and the like. While all of these efforts may involve live instructors, tutors, facilitators and so forth, the emphasis is clearly on the development and distribution of material to learners. A recent report prepared by the Cambridge Programme for Industry (Reynolds, 2001) states:

> To date the primary application of e-learning has been the delivery of structured programmes of study, or courses. While other approaches to learning do flourish in some organizsations (such as performance support, simulation, communities of practice...), the formal course leading to an award or qualification is still dominant (Reynolds, p. 81).

This general approach to instruction has its foundations in cognitive approaches to learning and instruction (c.f. Bloom, 1956 or Gagné, 1966), with an emphasis on effectively organizing and transmitting information from expert to novice. Viewed through this lens, the challenge for corporate training and development organizations is to identify and catalogue content from a variety of sources through learning management systems integrated with personnel systems and course registration systems. A great deal of effort has been invested in these activities in recent years as training and development organizations attempt to lower costs, improve employee access to "courseware," and bring learning to the desktop.

However, the Internet is not *only* a distribution channel. As powerful as it is, this approach should not define a signular vision for corporate e-learning. It is simply too restricting.

THE PLACE AND SPACE MODEL

The Place and Space model is named for its integration of both residential (place) and virtual (cyberspace) components. It is based upon an alterna-

tive and complementary view of the Internet that drives a different approach to e-learning. The Place and Space model views the Internet as a *communication* channel through which people access people in an information-rich network environment. When communication among people takes center stage and content is assigned a supporting role, the story fundamentally changes.

When we shift our view of the Internet in this way, alternative technology and learning paradigms move to the foreground. Computer-based training and content distribution models recede in prominence. In place of computer-based training, with its focus on "right" answers, we find more varied models of experiential and social learning (c.f. Kolb, 1984 or Senge, 1990). In place of an e-commerce model of computer-based transactions, with its focus on individual and on-demand access to content, we find an emphasis on collaborative work. These models connect people who work individually, in groups, and possibly teams, who exchange ideas and cooperate to develop unique solutions. These views of the e-learning landscape create different opportunities for corporate training and development.

This shift of view from distribution to communication and from content to people creates opportunities for alternative instructional and learning models as well. The power of the communication model lies in its ability to assemble groups of people who can interact, teach, and learn from one another. It brings the power to assemble people who share interests, who have something to contribute to each other, and who otherwise would not have the opportunity to interact.

Global computing and communications technologies dissolve borders and change the ways in which we can "be there" and the ways in which we can "be with one another." There is more to training and development than pumping "modules" through information pipelines. The challenge for training and development is not only to purchase or develop content and then distribute it over the wires. One aspect of the new challenge is to embrace and adapt technologies that help assemble and focus people and resources. Assembling people and resources from around the world and creating the circumstances through which they can learn through and from one another requires that we employ additional approaches to e-learning design and delivery.

Figure 1 depicts critical outcomes of viewing the Internet as primarily a distribution or communications channel. When the role of the Internet is essentially a *distribution* channel, its primary function is to provide access to content. The focus is, therefore, based in traditional behavioral or cognitive instructional theories and the resulting format is generally one of self-paced instruction. When the role of the Internet is essentially a *communications* channel, its primary function is to provide access to people. The relevant instructional theories shift from purely cognitive approaches to constructivist models, grounded in a social learning format.

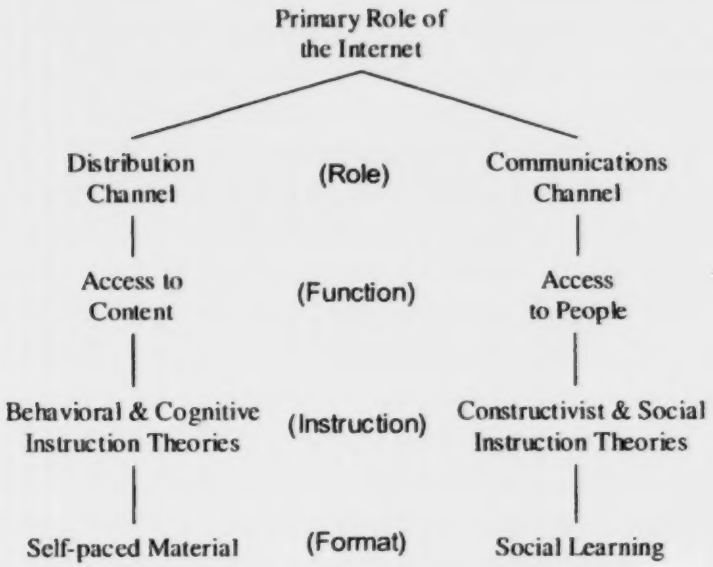

FIGURE 1
Differing Views of the Internet and Implications for e-Learning

The point is not that either perspective is "correct" or "better" in some general sense. Either view, in-and-of-itself, is inherently incomplete. The argument presented here is that one view has dominated and defined e-learning, and that this limits the opportunities to apply Internet technologies to management development. There are several taxonomies for classifying learning outcomes and relating them to instructional methods. Certainly, many outcomes that can be effectively and efficiently addressed using a content-centric model of e-learning. However, there are also important learning and development outcomes that are not well served by a content-centric model and require an expanded view of the teaching-learning process and the role of technology.

Simply put, when we think of instructional design and delivery in a broad sense, leaving "delivery modality" out of the picture, we have at our disposal a broad range of well-established instructional models to choose from. We face a series of well-established decisions and trade-offs concerning the alignment of instructional approaches with the desired outcomes, audience characteristics, scale, development and delivery costs, and so forth. However, when a shift in "delivery modality" is involved, and we consider the potential application of Internet technology to learning, there is a strong tendency for the primary focus to quickly gravitate to a didactic, content-delivery model based on an individualized, self-serve approaches to learning based in the computer-based training tradition. While approaches based in this tradition can be highly cost effective and efficient when applied in the appropriate circumstances, there is simply no reason

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to limit the application of Internet technologies to this class of instructional support.

The Origins of the Place and Space Model

The Place and Space model was developed from 1995 through 2000 at the Fuqua School of Business, Duke University. Here it served as the foundation for a series of innovative Internet-mediated MBA programs. In July 2000, Duke Corporate Education, an organization dedicated to the design and delivery of customized, non-degree corporate education programs, significantly expanded the model to non-degree management development applications.

Top-quality management development programs, degree granting or not, are inherently professional development programs. In their traditional classroom format they are focused on the needs of well-qualified and experienced participants with unique backgrounds and perspectives.

The composition of the class matters significantly. "Who is in the room" matters because ideas are presented with the expectation that they will be challenged, further developed, and adapted to meet the real world in which they must be applied. Textbooks and other instructional materials are important elements in these programs; however, no one would seriously propose that reading the book is an equivalent learning experience to being in the room and participating in guided dialogue and discussion. It is not surprising, therefore, that these institutions would view the Internet as an opportunity to extend and expand the power of cohort-based, social, interactive, and experiential approaches to learning. This perspective has guided the development of the Place and Space approach.

Place and Space vs. Blended or Hybrid Instructional Models

The concepts of "blended" or "hybrid" learning programs have been developed to describe offerings that combine e-learning approaches with traditional face-to-face classroom learning. Typical blended or hybrid models enhance

1. A residential classroom experience with preparatory individualized learning experiences,
2. Follow-on individualized learning experiences,
3. Or both.

Typically these models give course participants access to on-line material prior to the classroom experience in order to assure a common understanding of basic concepts and vocabulary prior to a classroom experience. In addition, they give participants access to on-line materials following a classroom experience in order for students to go deeper into a subject. In both of these examples, the use of e-learning remains focused on individuals gaining access to self-serve materials in an on-line format. While all manner of other learning methods may be employed in the classroom component of blended courses, the use of e-learning remains focused on individuals accessing information through a network.

The Place and Space model has a different emphasis. The primary application of "e" is to allow communication among individuals collectively engaging in a structured and guided discussion. It is primarily about solving problems, applying concepts, and making personal meaning from experiences through structured, supported reflection and generalization. So, while the Place and Space model is certainly about blending classroom and Internet-mediated learning, it is not primarily focused on access to content by individual learners.

Because of its emphasis on connecting people who have something to learn from one another, the Place and Space model surpasses traditional residential-only experiences in various ways. The reasons are quite simple, really:

1. We assemble more powerful cohorts of instructors, participants, and resources by exploiting the global reach of the Internet. That is, we can greatly impact "who is in the room" in a virtual sense.
2. We extend the residential experience through space and time to the workplace. By bringing the collective involvement and support of the "group" to the workplace, we can span the gap between the concepts themselves and the application of those concepts. That is, we extend the concept of "learning *at* work" to "learning *through* work."

We assemble people who share interests and have more interesting things to say to one another when we can draw from a wider geographic area and bring people together from across intact work groups. As learning designers, we use this technology to extend and amplify the power of social interaction in learning.

The effectiveness of this approach to learning is highly dependent upon guided discourse, with an emphasis on reflection and the development of insights derived from shared experiences. Raelin (2000, 2001) thoughtfully connects the domain of work-based learning to the more general concepts of experiential learning. In particular, he articulates the importance of public reflection on experiences. Similarly, Smith (2001) highlights the links between reflection and action learning in the context of leadership development. The Place and Space model is particularly useful in enhanc-

ing and extending the effectiveness of project-based, or work-based learning, as it brings support and structure to 'learning through work,' with a particular emphasis on strengthening the role of sharing of participant experiences and subsequent public reflection.

BROADENING THE CORPORATE E-LEARNING MODEL

Figure 2 depicts a three-dimensional space. This space is useful in thinking about learning programs in general, and the role of e-learning in particular.

The first dimension, **Knowledge Dynamism**, addresses the distinction between pre-defined content and content that that is created dynamically. Many learning interventions focus on the transmission of relatively static knowledge. It is easy to point to examples of this type of knowledge in college and university curricula. For example, an introductory statistics course generally consists of well-defined concepts, rules, and processes that are relatively stable over time. There are lots of "right answers."

The other end of this dimension is defined by more dynamic knowledge. This is knowledge that does not pre-exist. It must be developed. Examples within the corporate community would include "What should our new product development strategy be?" or "What can this work unit do to implement the new customer focus strategy?" Outcomes such as these require applying knowledge and conceptual frameworks to unique situations and creating new understanding. There are few right answers that are known in advance.

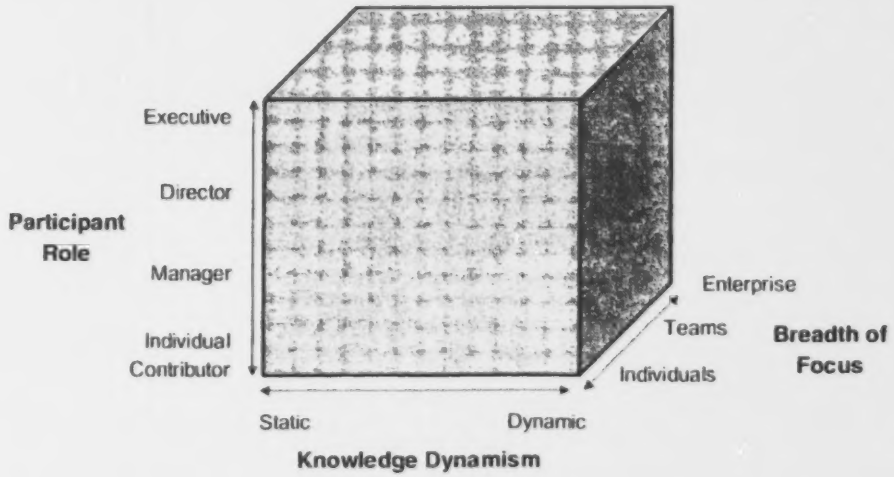

FIGURE 2
A Three-Dimensional e-Learning Space

The second dimension is **Participant Role**. Participant Role captures the degree to which participants are considered as individual contributors, managers, directors, or executives within the firm. This dimension also captures "transitional" circumstances between these roles. That is, participants in a learning program might be preparing for a transition, or being supported during a transition, from one role to another. It is not uncommon for management development programs to coincide with transitions such as these.

The third dimension is the **Breadth of Focus**. This dimension reflects the degree to which learning focuses on individual capabilities, the capabilities of teams or intact work groups, or the capabilities of larger organizational units.

Most traditional applications of e-learning fit near the origins of these dimensions, as shown in Figure 3.

That is, most traditional e-learning applications are generally focused on transmitting predefined content to individual contributors, and are intended to build individual capabilities. The most common characteristics and benefits of this style of intervention are captured by the phrases "on-demand," "self-paced," "self-served," "anytime and anywhere," "modular," and the like.

However successful it may be in some applications, this approach is inherently limiting when it is adopted as the centerpiece of an e-learning strategy. It simply does not exploit the full power and potential of the available technology, and it restricts our view of learning to cognitive models of content acquisition.

The Place and Space model clearly applies to the other ends of these dimensions. That is, Place and Space programs tend to emphasize the

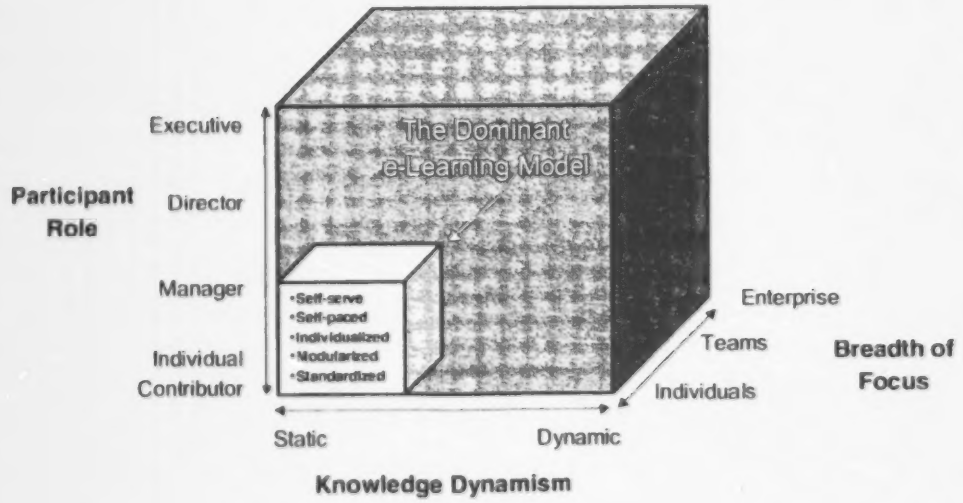

FIGURE 3
The Dominant e-Learning Model

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development of mangers, directors, and executives. They are capable of expanding the focus to the enhancement of teams, work groups, and the firm itself. And, they are most appropriate in settings where the "right answer" is not known in advance. As such, they provide an intuitively better fit to management development programs. More importantly, they serve to amplify and extend the learning experience rather than water it down. They offer critical new strategic opportunities to dissolve the geographic and organizational boundaries that limit traditional residential offerings.

As depicted in Figure 1, there tends to be an alignment of one's view of the Internet, learning theories, instructional theories and the resulting format for e-learning offerings (For an excellent in-depth treatment of this topic, see Reynolds, 2001). It is important to note that in many situations an on-line, self-paced, self-served, modular, and individualized course can be an efficient and effective approach to achieving important learning outcomes. Alternatively, there are situations in which a highly collaborative, experiential approach that takes full advantage of disparate points-of-view is a more appropriate path. The point is mearly that neither of these very general approaches taken alone is capable of defining the entirety of the corporate e-learning space.

That being said, the Place and Space model offers a unique opportunity to bring the power of social, dialogic learning designs to corporate management development programs, thus expanding the role of e-learning well beyond its current status as a course management and delivery vehicle. Some of the unique applications of this view are illustrated in the following examples.

EXAMPLES OF PLACE AND SPACE PROGRAM DESIGNS

Each of the illustrations below provides a brief example of a Place and Space program design for management development. In each example a "traditional" residential program is described as the foundation from which a re-designed program is described. The re-designed program takes advantage of Place and Space design elements. These examples are necessarily highly abbreviated descriptions that obviously omit numerous details. However, they do illustrate very practical applications of the Place and Space model to concrete learning program designs.

Example 1—Leadership Development and Business Challenges

Consider a conventional leadership development program that is based on a "business challenge" or "action learning" model. High potential man-

agers from across the firm are nominated and invited to participate in a two-week leadership development experience. The experience includes a 360-degree assessment of leadership skills.

The Traditional Residential Format

The traditional residential program includes personal feedback and coaching based on the 360-degree assessment, and the development of a personal leadership development plan. During the two-week program, participants are introduced to a leadership model, and assembled into teams. Each team is given a business issue sponsored by one of the firm's executives. The challenge for the team is to develop and present an analysis of the issue and a proposed solution.

The business challenge format provides relevance and context for the experience. Facilitators for the teams also provide individual feedback and coaching sessions for participants based on their personal leadership development plans. Teams have an opportunity to interact and share their experiences in a debriefing session following each team's presentations of their analysis and proposed solutions.

This is, of course, only a very brief sketch of a leadership program. However, many firms offer some variant of this general model. The duration may vary, the leadership models may vary, and additional topics and activities may be included. But, the general template is recognizable. Using this model as a starting point, we will apply Place and Space concepts to illustrate ways in which the overall experience might be more effective both for the individuals involved and for the firm overall.

Example 1—The Place and Space Redesign

First, consider splitting the two-week program into two pieces, separated by a two-month "distributed work session." During the distributed work session, participant teams continue to work together on their projects using on-line asynchronous collaborative tools. A part of the first residential session is used to introduce the teams to the virtual environment and develop a plan for carrying the project forward in time. Preliminary roles, responsibilities, and expectations are established. Work is initiated.

During the two-month distributed work session, an on-line facilitator and a relevant content expert support the team as they address their particular business challenge. The fact that interaction among team members is captured in the on-line environment allows the team facilitator to "observe" and help where needed, and to provide individual council and

coaching as required. The teams may be assembled across functional areas and/or geographic regions as is appropriate for the challenge they face and the overall objectives of the program.

The second residential meeting focuses on the teams' presentation of analyses and recommendations to executive sponsors, sharing of experiences across teams, additional leadership content, and the like. Following the residential meeting, if it is possible and desirable, some or all teams may continue to work in their virtual team environment to advance their project into an implementation stage.

Using the very simple Place and Space design elements described above several advantages are achieved:

1. The challenges are less "illustrative" and become more real. By extending time, participants can dig more deeply and be more thoughtful in their work. It becomes less of an exercise and more of a real work environment. Motivation increases because people understand they are working on something real and they can actually make a difference.
2. Leadership development and personal reflection take place over an extended period of time with more opportunity for realistic situations to present themselves. The more real the work, the more opportunity there is to expose and address leadership issues.
3. Participants have an opportunity to work and network on a deeper level with peers from different areas of the firm. Points of view are shared and more enduring relationships are formed.

Example 2—A General Manager Development Program

Consider a common problem in building organizational capabilities. Skilled and talented individuals within the firm require general business skills. This need frequently arises as firms grow their talent. Individuals who have served in specialized roles must be better prepared to assume new, general management responsibilities.

The Traditional Residential Format

One common approach is for firms to develop and offer "business acumen" programs, sometimes referred to as "mini-MBA" programs. These offerings typically consist of a half-dozen courses arranged in sequence. They resemble the general business core courses in an MBA program, such as marketing, strategy, organizational behavior, finance/accounting, and the like.

Often a mix of internal presenters and faculty hired from local institutions teaches these programs. The programs are generally offered for participants who are located in the same region and consist of regular class meetings similar to an evening/weekend program offered by a local college or university. Students may meet weekly or semi-weekly in a traditional classroom setting.

Example 2—The Place and Space redesign

The Place and Space model is easily adapted to this program format. The characteristic ways in which the Place and Space model are applied to traditional curricular offerings of this type are:

- *A structural reconfiguration of the class meeting schedule.* Using a two-month long course structure as a model, a representative redesign would transform the residential meeting structure by dividing the calendar time into three segments. The first is a relatively short pre-residential preparation period during which participants review preparatory materials (in on-line, multimedia, or traditional media formats.) A relatively short residential meeting used to introduce the course, facilitate relationship building, and introduce and build student teams immediately follows this pre-residential period. This is the "classroom" portion of the course. This phase is followed by a longer (perhaps five- or six-week) "distributed" session during which participants use a collaborative on-line work environment to complete both individual and team-based assignments.
- *A distinct emphasis on team-based learning.* On-line collaborative technologies enable the extensive use of collaborative student teams. The benefits of this capability are described below. It is common to take advantage of the powerful combination of distributed learners and collaborative on-line learning environments to significantly enhance the effectiveness of the overall program.
- *More "relevant" assignments and exercises.* Typically, the distributed learning portion of Place and Space course offerings invite more project-oriented and application focused activities than are characteristic of strictly residential course offerings. This is a direct outcome of the power of distributed teams and collaborative technologies. The result is courses designed around "real work" activities, as opposed to reliance on artificial "exercises" and short individual assignments.

Using the simple Place and Space design elements described above several advantages are achieved:

1. It is now possible to assemble participant teams from geographically distant locations and different functional areas of the firm. This means that participants can now work with and share perspectives with individuals with whom they might not otherwise have the opportunity to work. There are numerous opportunities to build cross-functional and cross-geographical understandings and relationships.
2. The ability for diverse teams to work collectively offers an opportunity to assign meaningful and applied work assignments. Differing perspectives and broader underlying skills and experiences on the teams mean that the assignments and exercises can require a broader set of underlying skills and understandings.
3. The team structure adds motivation and commitment to the experience. People on teams are especially likely to participate given the personal commitments and dependencies that underlie well-designed team activities.
4. People working on distributed teams in a class context are also learning to work on distributed teams in other contexts. These new methods of working translate into important individual and organizational capabilities.
5. Participant teams mean that a broader set of skills and understandings can be brought to bear on assignments and exercises. This inevitably leads to increasingly complex, relevant and meaningful assignments. Quite simply, you can ask a team to take on a more complex project than you can an individual. As a result, there is greater *overall* learning and greater *peer-to-peer* learning, taking advantage of the opportunity for participants to learn from one another in the context of challenging and complex assignments.
6. Using geographically distributed teams creates a larger "catch basin" for courses. It is no longer necessary to find thirty or more individuals in a single geographic area in order to justify a course offering.
7. Considerable time savings are achieved by lower requirements for classroom meetings. This lowered requirement also makes it possible for more individuals to participate given a lower "intrusion" factor into their busy work and travel schedules.

Example 3—Supporting Manager Transition

Consider a third common manager development need. As individuals develop and are promoted, their roles necessarily change. The nature of their responsibilities necessarily changes. Specifically, consider managers who are new to a "middle management" role. Their changed role requires

new leadership skills, motivating employees, helping to translate corporate strategy for execution within functional areas, etc.

The Traditional Residential Format

The traditional residential format for this type of program is a weeklong residential meeting characterized by presentations on the nature of the new role and the personal development requirements it brings. It is also typical in programs such as these to introduce "tools" or "models" that can be used by those new to the role. These models or tools often take the form of checklists, rules-of-thumb and so forth for motivating employees, managing change initiatives, and the like. These tools or models are often put into practice in the classroom by introducing hypothetical situations.

The anticipation is that when faced with new challenges back in the workplace, these new mangers will recall the tools and models, read and reflect on their use in new situations and apply them effectively. That is, the program *prepares* them to apply new concept and approaches to future management challenges.

Example 3—The Place and Space Redesign

The power of a Place and Space design in a manager transition program of this type is its ability to "follow them back to work" and support participants in the actual application of these new concepts and tools. Consider the following redesign.

Figure 4 provides a diagram that relates a three-day residential program to the ensuing "follow them back to work" phase. The residential portion of the program is not unlike the traditional offering. However, following the residential offering, participants enter an application phase. During this phase, three different tools that were introduced in the residential portion of the program are applied in the workplace.

Take, for example, a tool that is designed to help diagnose and improve the functioning of a cross-functional project team in the firm. During the application phase of the program, each participant administers the Team Diagnostic Tool to members of an actual cross-functional team of which they are a member. Data on the team's performance is gathered. Each program participant brings their data to an on-line small-group meeting of five or six other participants and a facilitator. During this meeting, each participant presents the data they have collected and discusses the questions the data raise about their team's effectiveness. The small-group facilitator helps to summarize the findings, questions, and issues from the five

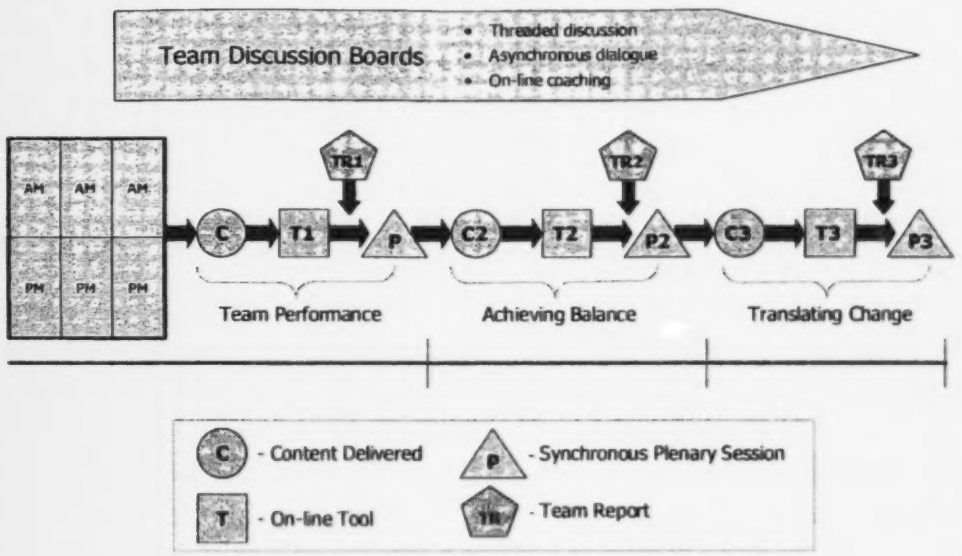

FIGURE 4
A "Follow Them Back to Work" Place and Space Program Design

or six participants. These results, along with those from the other small groups of participants are then presented in a synchronous, on-line session of all program participants and instructors. In this larger, plenary session, instructors are able to clarify and resolve issues as well as help participants generalize these individual experiences.

This process is repeated with a second and then a third tool. The result is a much longer period of "support" for participants extending beyond the classroom setting to the actual application of new concepts and approaches in the work setting. It "follows them back to work" and helps strengthen the connections between classroom concepts and application on the job. It moves from "learning for work" to "learning through work."

THE TROJAN HORSE AND NEW WAYS OF WORKING

The Place and Space model is fundamentally team-based, collaborative, and application oriented. It is based on technologies developed to allow physically dispersed individuals to participate as members of a group producing some type of work product. It is not surprising, therefore, that the examples provided above look and feel a bit more like "problem solving" and "work" than traditional training programs might.

One important result is that participants in Place and Space programs acquire important skills and experiences by working in new ways. That is, in the context of an educational program, participants learn to work with cross-functional and geographically dispersed teams in order to solve problems. This, in and of itself, can be a valuable outcome. In many ways, the metaphor of the Trojan horse applies. That is, participants experience an educational program with a surprise inside! Part way through the program, it is common for participants to actively explore ways of applying what they have learned through Place and Space based e-learning *as a medium* to e-teaming, e-leading, and e-managing as new ways of working.

It is often lamented that organizations have difficulty helping management adopt new collaborative technologies and methods of working. Often these technologies are underused or unevenly applied in firms that have made significant investments. Place and Space programs have the unique ability to "jump start" the process of adopting these tools through meaningful and practical experiences. To the extent that these outcomes are explicitly desirable, e-managing, e-leading, and virtual teaming can be included as explicit program content.

SUMMARY

The Place and Space model successfully expands the traditional corporate view of e-learning. In particular, it brings the power of collaboration, communication, and social learning to corporate education experiences. The power of the model is derived from its use of learning grounded in work, cohorts of experienced managers, its focus on dynamic knowledge, and the appropriateness of social learning models to address the development needs of the firm's managers.

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CHAPTER 7

INTERPERSONAL COMMUNICATION TRAINING WITH TOMORROW'S TECHNOLOGIES

Michael Henninger and Birgit Weingandt

This chapter deals with training in interpersonal communication with the help of tomorrow's technologies. We will concentrate on the basic principles which need to be considered with respect to designing training in communication competences with the help of new technologies. For this purpose, we first want to describe the meaning of communication competences for managers. We do not want to give a complete and comprehensive overview of software with which soft skills currently can be developed. Characteristics and contents of these programs change at a fast pace; some of them are only used for a short period of time and then are no longer available on the market or are tailored to the specific needs of organizations. Our focus lies in the description of what is meant by "communication competence" and which are the aspects most relevant for the design of communication training. Then we will examine traditional and new concepts in communication training employing new technologies with

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respect to these aspects before describing an example of a blended training program of soft skills which integrates software-supported training with the tool CaiManOnLine© and face-to-face training sessions, and which is continually improved on the basis of research.

RELEVANCE OF COMMUNICATION SKILLS IN ORGANIZATIONS

Communication Competence in Management

Of the many competences that managers are supposed to possess (see Barry, 2000), soft skills are finally being recognized as very important. In some companies, up to 20 per cent of a manager's bonus depends on his "people skills" (see Loizos, 2001). According to Loizos (2001), a manager's soft skills may be key to a company's future performance. Of these skills, the relevance of competence in communication is often highlighted (Blair, 1992, 1995; Frey, 2000). There is extensive literature on the relevance of the concept of communication skills to human interaction (Argyle, 1981; Daly, Friedrich, & Vangelisti, 1990; Guirdham, 1990; Hargie, Saunders, & Dickinson, 1987; Rae, 1985). According to Frey (2000), these competences also play a decisive role when it comes to the question of whether an organization's projects can be realized successfully, whether the employees work efficiently and with commitment, and whether cooperation can be achieved. He supports the position that problems and failures in organizations mostly stem from serious disturbances in communication within organizations (Frey, 2000). For some, communication is the tool for doing the work of leadership (Aaltonen, 1998). According to Theis (1994), empirical studies support the fact that communication in organizations takes up about 60-80 per cent of the available time. This aspect leads Santosus (1999) to demand that companies need to equip 'recent arrivals to the executive ranks' with the softer skills necessary to succeed in their new roles in interpersonal communication, public speaking, consensus-building, perceptiveness and the like. According to her, too many promotions fail because companies do not recognize that new executives need training specific to their new roles (Santosus, 1999).

The necessity of communication competence for managers therefore is clear (Jablin & Sias, 2001). Today, many successful programs in communication training are available for developing managers' communication skills. The chances of advancing the career with the help of specific, job-related qualifications like communication skills are increasingly recognized (Antos, 1996).

In this contribution, we want to use the example of the broad competence area of "communication" to show how this area can be specified and modularized and which important characteristics need to be paid atten-

tion to when designing training. Afterwards we will see how these points are dealt with in different training forms. Because it is easier to understand and evaluate training programs if it is clear what the key characteristics of the training objectives are (Cohen & Rustad, 1998), first we will take a closer look at the term "communication competence" and the communication skills relevant for managers.

Communication Skills

For the purpose of describing different training concepts, it is helpful to distinguish between various aspects of communication competence. According to Jablin & Sias (2001), some authors distinguish decoding or speech-receptive abilities (e.g. listening, attentiveness, sensitivity; see Herrmann, 1992) from encoding or speech-productive abilities (e.g. getting to the point, writing ability, clarity of expression; see Herrmann, 1992). Both aspects are equally important, but the speech-receptive parts are especially important when it comes to avoiding misunderstandings, as shown above. Without attentive listening and successful understanding between interlocutors, the best rhetoric runs the risk of being misunderstood, misinterpreted, or simply ignored.

Everybody has acquired a large repertoire of communication skills which are highly automated over the course of a lifetime (Henninger & Mandl, 2003). Understanding and talking are things we do without conscious control over every aspect of communicative action. Thus communication skills are highly automated. This does not mean, of course, that there are no complex cognitive processes going on in the background. But these processes are not directly accessible to the speaker or hearer. Just as is the case with motor behavior like walking, we profit from this automatism—which can be easily demonstrated by trying to consciously plan individual steps when going up a staircase (but watch out—you might stumble!). When communicating, the fluency of dialogue similarly derives from the automatism of communicative behavior. But it is doubtful whether the automatism relevant to everyday life is sufficient for the communicative demands a manager is faced with. Failures in dealing with people can have more far-reaching consequences in responsible positions than in our usual everyday life. The complex communicative tasks in the job profile of managers make it necessary to learn new—role-compatible—behaviors and change old, automated ones.

In the following paragraph we want to present some examples of managerial functions that demand special communicative skills.

- **Conflict-management.** Maybe the most important challenge for managers is to solve complex, unpredictable problems that cannot be

dealt with as matters of routine (Regnet, 1992). Usually this is the case with interpersonal conflicts that might occur in human relations every now and then but in some cases can seriously disturb the working atmosphere. Therefore on the one hand managers must be able to notice indications of conflict situations while on the other hand they must be able to deal with them carefully—so in the best cases, conflicts can even lead to positive results (Rosenstiel, 1992). This concerns conflicts in which managers are involved themselves as well as conflicts among others. In the latter case the manager mainly acts in the role of a moderator instead of a problem solver (Regnet, 1992).

- **Meetings.** According to Fulk & Collins-Jarvis (2001: 624), "Meetings are very common organizational communication events. They involve fundamental communication processes including sensemaking, control, power relations, structuration, and decision making." Thus meetings fulfil important functions but are time-consuming as well—especially for managers who have to include time for preparation (Fulk & Collins-Jarvis, 2001). In order to lead efficient meetings, managers need communicative competences as moderators (Comfortt, 1997; Blom, 1999).
- **Leadership.** As several authors point out, leadership today has in some areas become more indirect, e. g. managers need the ability to support the self-regulatory capacities of employees and to support a cooperative working culture which requires differentiated empathic competences (Rosenstiel, 1998; Spieß, 1998; Spieß & Winterstein, 1999; Wunderer, 1998).

Leadership psychology stresses the fact that in addition to informing, listening and understanding—the so called speech-receptive competences—are two factors which are equally important for a successful conversation (Boneberg, 1999; Cooper, 1997; Lippmann, 1999). Jablin & Sias (2001) found in their review about studies on communication competence in organizations that among others, listening competence and empathy play an important role at the individual level.

In conflicts, it is especially hard for people to listen attentively to what the communication partner is saying. This can lead to misunderstandings and annoyances. Furthermore, the chances of being able to make one's argument effectively—a point of great importance for managers since a lot more (especially financially) can be at stake here than in other everyday conflicts—are a lot lower if one has not understood the communication partner's position, as well as their feelings and wishes. Additionally, there is less willingness to accept factual arguments in an emotionally charged conversation when the communication partners feel that their own perspective is not paid attention to (Clark & Brennan, 1991). But even though listening is regarded as a key skill for managers (Blair, 1992, 1995; Wolvin

& Coakley, 1991), few training programs really focus on this skill for several reasons, as we will show.

Implications for Communication Training

To summarize—what are the most important characteristics of communication which need to be taken into account when conceptualizing training?

As mentioned above, the skill is composed of two components: speech-production and speech-reception. Speech-production primarily involves speaking, the formulating of utterances. Such interactive skills are best trained in interaction with others. Speech-reception—like speech-production—is highly automated. In order to change the way we listen or understand, we first need to de-automate this behavior by reflecting on it, and then re-automate it again. These processes require individual and repeated training (Henninger, 1999; Henninger & Mandl, 2003). Since these processes take place within the individual, speech-reception does not necessarily have to be trained in interaction with others. There are two more important points to consider. One is that communication is always situated in a certain context and the second point is that communication is context-bound in nature. Thus, learning should be situated and authentic, i.e. it should take place in situations or contexts relevant to the learners and similar to their everyday life. Learners should be able to actively deal with the subject of learning and reflect on it. All these points are closely related to the characteristics of communicative behavior. Therefore, it seems sensible to apply these principles of the situated approaches to the design of communication training.

One leading approach to situated learning is the Cognitive Apprenticeship approach by Collins, Brown, and Newman (1989). In this approach experts function as models and coaches who explain their actions while working, thus making the whole process transparent and comprehensible. The expert's support is slowly reduced with the growing expertise of the learner. These processes can be transferred to communication very well. In communication training, the trainer is model as well as coach, who supports the participants in changing their communicative habits. However, as described above, these habits cannot always be accessed directly. The participants frequently only recognize the result, but not the process of their communicative behavior. The outcome stands at the end of often lengthy cognitive activities which cannot be directly concluded from the outcome itself. Thus, ways need to be found in order to make the often unconscious thinking strategies of experts and learners transparent. For example, in role plays depicting typical communication situations, the trainer can demonstrate a certain aspect, explaining what he is thinking while performing that particular behavior (modeling), thus making his thinking strategies transparent to the learners. He then lets the participants re-enact the scene

and supports them (coaching and scaffolding). Finally, he reduces his support with the growing expertise of the participants (fading). One important demand made by this Cognitive Apprenticeship approach (Collins et al., 1989) is that of authenticity: the abstract tasks need to be integrated into contexts which are relevant for the learners and with which they are familiar.

For management, this means that specific adaptation of training to managers' daily communication situations, e. g. conflict solving, meetings or leading employees as well as specific adaptation of their previous knowledge about coping with these situations, is necessary. If the training succeeds with this adaptation, there is a high probability that new communicative behavior will be transferred from the training situation to everyday life.

COMMUNICATION TRAINING CONCEPTS

Traditional Ways to Train Communication Skills

One frequently-used way to train soft skills such as communication competence is to buy training books or practical guides in order to deal with concrete communicative problems. Print media are fit for flexible, individual learning; they can convey the theoretical features of an enhanced speech-receptive and -productive behavior and give clues for practice. The problem with using books as a means to solve communication problems is that while books may convey a lot of *knowledge* about communication, they do not necessarily lead to changes in the communicative *behavior.* One reason lies in the one-dimensionality of text-based communication in which nonverbal and paraverbal signals cannot be transmitted. This also does not allow proper training of communication, since the training situation is very different from the actual application situation, i.e. face-to-face interaction. Consequently, the knowledge about communication conveyed through books might remain abstract; this type of knowledge is also called "inert knowledge" because it cannot be completely converted into action (Renkl, 1996). And finally, when learning communication from books, there is no way for the learners to receive flexible support and feedback.

Another possibility is to use traditional training concepts, e.g., face-to-face seminars with about 12-20 participants, with a duration of 1-4 days (Brons-Albert, 1995): Over the past three decades, there has been an increased interest in communication skills training (Dickinson, Hargie, & Morrow, 1989, Hargie, 1986). According to Hargie and Tourish (1994: 1378), there is a huge "increase in courses aimed at enabling people to become more proficient in their exercise of such skills." In a meta-analysis

by Guzzo, Jette, and Katzell (1985), training and instruction, i.e. in the form of behavior modeling or management seminars, proved to be the most potent factor in improving productivity. The evidence of a meta-analysis by Burke and Day (1986) suggests that management training affected the behavior of trainees, especially regarding the training in human relations and communication. Thus, it can be shown that communication skills training is an effective means of changing trainee behavior, at least with respect to speech-productive aspects.

Since the speech-productive skills, i.e. the skill to lead a conversation, to a large extent implies interaction with others, it seems sensible to choose forms of training which allow interaction between participants. This of course is the case with group-oriented face-to-face training. It is no coincidence that the focus of traditional training concepts is on the training of interactive skills, i.e. speech-productive aspects, since this behavior can be efficiently and authentically trained in face-to-face settings with medium to larger groups of 10-20 participants, e.g. through the use of role plays and small group reflection. As mentioned above, communication can be trained successfully if the trainer integrates content which is relevant to the participants. Furthermore, the trainer can adapt to the group and give them flexible support and individual feedback.

However, these traditional training concepts also have several limitations. Much training focuses too much on the speech-productive parts of communication, such as formulating utterances or choosing answers, and neglects the speech-receptive parts, like listening and understanding (Antos, 1996). The unequal treatment of both aspects is partly due to the fact that trainers often do not have enough time and thus concentrate on practicing new (speech-productive) techniques, rather than leaving enough room for training the more reflective (speech-receptive) parts. Another reason can be found in the fact that working with speech-receptive aspects in a group-setting is often more laborious and takes more time (de-automation and re-automation are time-consuming). Since this individual communication skill does not involve interaction with others but requires each participant to focus on his own behavior, it can be done at other times, without disturbing the course of face-to-face training sessions.

Managers' training especially needs to take into account that their time is limited and that long absence from the workplace is expensive for the organization. Therefore flexible arrangements would be best suited.

New Training Concepts with the Help of Tomorrow's Technologies

Software-supported concepts might be the answer to these problems. They offer more flexibility, more learner control and possibilities for

just-in-time and just-enough learning (Cohen & Rustad, 1998; Heathman & Kleiner, 1991).

One question that has to be clarified first is whether soft skills like communication competences can be taught using software-supported training. Until recently, the typical forum for soft skills training was the training center or seminar room, but with the development of software-supported communication training, organizations are increasingly transferring soft skills training into their e-learning systems (Barbian, 2002b).

However, training of soft skills with software is naturally not successful per se. "Those of us with an interest in soft-skills training should take a good look at what technology can do for us and what it can't" (Cohen & Rustad, 1998: 32). Thus, it can only work if certain points are paid attention to. According to Horton & Horton (2000), the skill to be trained needs to be analyzed in order to identify what aspects of the skill can best be taught using software-supported training (see also Barbian, 2002b; Cohen & Rustad, 1998). As we mentioned above, teaching the individual speech-receptive skills using software-supported training promises more success than the training of interactive, speech-productive skills.

If speech-receptive skills are to be trained with software, several points need to be remembered. First, the subject needs to be differentiated in such a way that it can be trained in a software-supported learning environment. With respect to speech-receptive skills, this can mean that the participants should analyze communicative utterances which are presented in video-sequences with authentic contexts. Furthermore, they should be given room for reflection, e.g. by asking them to explain their analyses of the communicative utterances, and finally, their communicative behavior should be modeled, e.g. by giving them the chance to compare their own analyses with those of an expert (see below).

In addition to the instructional principles, it needs to be borne in mind that soft skills training is a sensitive area. Not every person who wants to foster his or her communicative behavior is used to learning with computers or even willing to use them (Henninger, Hörfurter, & Mandl, 2001). Thus it needs to be clear that technology should only function as a tool for learning (Cohen & Rustad, 1998), e.g. by showing that with new technologies you can train certain aspects more effectively than before, as can be seen with respect to speech-receptive skills (see below).

One further point that needs to be paid attention to with respect to software-supported training of communication skills, i.e. speech-receptive skills, is the following. As mentioned above, in communication, there is no 'right' or 'wrong' (see Hargie & Tourish, 1994). Therefore, it seems to be better to provide the learners with tutorial support rather than with expert systems, such as Intelligent Tutoring Systems (Shute & Psotka, 1996) where computer programs evaluate a participant's answers and tell them whether they are right or wrong. Human tutors can flexibly adapt to learners and give them individualized support and feedback on their learning progress.

The online tutor can interact with the learner via chat, audio- or video-conference.

However, one problem that is often mentioned in connection with text-based computer-mediated communication or tele-tutoring is that some people consider this form of interaction as impersonal. This is due to the lack of nonverbal cues which enable the communication partners in face-to-face settings to build immediate contact and interpret the communicative and relational context appropriately (Hiltz, 1994; Postmes, Spears, & Lea, 1998; Spears, Lea, & Postmes, 2001; Walther, 1992). According to the "cues filtered-out"approaches (Culnan & Markus, 1987), a lack of nonverbal cues will have a negative effect on communication: the fewer communication channels are available, the less nonverbal cues are transmitted, the lower the "social presence" (Short, Williams, & Christie, 1976) of the communication partner will be perceived, i.e. the speaker loses the feeling of communicating with a "real" person because of the reduced nonverbal cues available (see Short et al., 1976; Viswanathan, 2002). Face-to-face communication is said to convey the highest degree of social presence (Short et al., 1976, Viswanathan, 2002; Walther, 1992) because of its synchronicity and the unrestricted and immediate perception of nonverbal cues. A reduced feeling of social presence may lead to insecurities and thus make the users feel uncomfortable with using the medium. This might be avoided by using audio-visual media for communication which come closest to the social presence of face-to-face situations (Short et al., 1976). Another theory which can give helpful clues for the choice of the media employed in computer-mediated communication is the theory of media richness (Daft & Lengel, 1984; Dennis & Kinney, 1998; Rice, 1992). Here, media should be chosen in accordance with the complexity of the task at hand: the more complex the tasks get, the "richer" the media should be (i.e. the media should allow immediate feedback and convey more nonverbal cues—therefore, media like video-conferencing should be employed when interacting with another person and dealing with a complex task). This theory was conceptualized for organizational communication and has interesting connections to the theory of social presence (Short et al., 1976) which need to be further explored, especially with respect to the implications these theories have regarding tutorial support.

Resume for the Design of Communication Training

What can be concluded from all these points described above? Communication competence can be divided into speech-production and speech-reception. As shown above, speech-production with its more interactive skills lends itself more to face-to-face training, while speech-reception, taking place within the individual and also being highly automated

(therefore requiring time for changing) lends itself more to software-supported training. Authenticity can be maintained by implementing content into the training which the participants are familiar with and which is relevant for their job. However, even in the individual learning sessions, the learners are not completely left to themselves—tutorial support should be given by online tutors.

Because communication competence has both interactive and individual components, the integration of individual learning phases for the training of speech-receptive behavior into a traditional training concept with face-to-face sessions for the training of speech-productive behavior should be pursued. It offers more flexibility and training possibilities than traditional face-to-face approaches because of software-supported individual training sessions. This combination of online and offline methods complementing each other, of software-based and face-to-face elements, is called a blended approach (Barbian, 2002a, b; Kerres, 2002; Kerres & Petschenka, 2002). More and more authors and trainers are convinced of the advantages of such a concept: We need to "begin thinking in terms of both/and rather than either/or when it comes to high-tech versus traditional soft-skills training" (Cohen and Rustad, 1998: 37). Zenger and Uehlein (2001) claim that instructor-led training and new technology-delivered training can be combined to create something far better and that successes are already being achieved through this integration. When "the learning objective extends beyond absorbing facts to changing behavior or learning new behavior, blended solutions can be ideal" (Zenger & Uehlein, 2001: 58). As we will show below, we support this statement. In the following, we want to present a blended learning concept which was designed for the training of communication skills and which trains both speech-productive and speech-receptive parts in a balanced way. Furthermore, it considers the important aspects named above: authenticity and flexible support. These aspects are very important when it comes to the question of whether training is particularly suited for educating managers and is therefore accepted by them.

A BLENDED COMMUNICATION TRAINING CONCEPT

First, we will present the software-supported training tool CaiManOnLine©, then we will show its integration into our blended training concept.

The Training Tool CaiManOnLine©

With the multimedia-based learning environment CaiMan© (Computer Aided Management Applications) and its further-developed, web-based version CaiManOnLine©, we will demonstrate a training tool which has

been employed successfully in blended communication training for several years and which is being continually improved on the basis of scientific research studies. CaiManOnLine© does not substitute traditional training concepts, but is used in order to train important learning contents, i.e. speech-receptive skills, more deeply, and efficiently.

As mentioned above, communication behavior is highly automated. Thus, it is first of all necessary to be conscious of one's communicative and behavioral style and to reflect it based on specific aspects (de-automation). Only then does it make sense to train new patterns of behavior or change old ones (re-automation). The web-based training tool CaiManOnLine© enables learners to foster a differentiated understanding of utterances in several individual training sessions, with a focus on the speech-receptive area. With the help of a didactically-designed user interface, the learners can watch different video-sequences which mostly show a problematic communication situation, e.g. in the form of a dialogue. It is the task of the learners to analyze the video-sequence according to given criteria. In order for the learners to systematically analyze the communicative utterances presented, we have chosen the theoretical model of Bühler (1934)[1]. According to Bühler (1934), three levels of an utterance can be distinguished: *expression* (what does the speaker express about himself?), *appeal* (what does the speaker want the hearer to do or think?) and *representation* (what facts does the utterance contain?) (Henninger et al., 2001: 5). It is important that the learners explain their analyses and have the opportunity to compare them with the analysis of an expert in order to foster reflection and learning (Henninger & Mandl, 2000; Henninger, Mandl, & Law, 2001). The trainer can flexibly adapt the learning environment to the individual needs of his group with comparatively little effort: The video-sequences can contain scenarios from the learners' workplace experience, e.g. a conflict between a manager and an employee. Thus, the context is authentic and relevant (Henninger, Mandl, Pommer, & Linz, 1999)—as demanded by Collins and his colleagues (1989).

CaiManOnLine© is designed in such a way that the learners can fully concentrate on their analysis of communicative utterances and are relieved of other tasks (Henninger & Mandl, 2003) The learners do not have to memorize the entire complex conversational situation—content-related utterances, intonation, facial expressions and gestures of the speakers—for their analysis, but can choose specific passages which they want to watch again. Thus, CaiManOnLine© offers a possibility for reflection which does not exist in everyday speech situations and which is also difficult to realize in group training.

The learning phases in the speech-receptive area with the tool CaiManOnLine© form a solid basis on which the strengths of face-to-face group sessions for training speech-productive aspects can be exploited, as will be presently shown. This way, the face-to-face training sessions are also effec-

tively relieved of those parts of the training which can be trained more intensely, economically and flexibly in individual learning sessions.

Next, we will describe our blended training concept as well as some important empirical results.

A Blended Learning Concept for the Training of Communication Skills

The training tools CaiMan© and CaiManOnLine© were developed for the first training module of a 4-semester moderation seminar, in which several hundred students from different disciplines (Psychology, Pedagogy, Computer Science, etc.) took part. This first training module covers one semester and has a blended design, i.e. it combines face-to-face and software-supported elements in the training of speech-receptive and speech-productive elements. Basic communication competences are trained which enable students to deal with typical conflict situations in their everyday life constructively.

The following concept has proved very successful in training (Henninger, 1999): In a two-day, face-to-face group session, the participants go through exercises which familiarize them with speech-reception, thus focusing perception and understanding. After this two-day session, there are six individual learning sessions with CaiManOnLine© where the learners can intensify their speech-receptive training with the goal of a more differentiated understanding of communicative utterances. Here, learners are given enough time to de-automate, change and re-automate their communicative behavior. The learners can be supported by trained tutors via chat, audio- or video-conference. In this phase, the learners are relatively flexible with respect to time and place of their learning. Another two-day face-to-face group training session constitutes the end of this first module. In this second group training session, the focus now lies on speech-production, i.e. the training of new conversational techniques (e.g. for constructive conflict resolution), and is based on the acquired speech-receptive skills. Authenticity is maintained throughout, using, for example, role play (face-to-face sessions) and video-sequences (CaiManOnLine©) with content relevant to the participants. Furthermore, with this concept, the skills are never trained abstractly but are always situated in a particular context. Finally, the participants get flexible support during the face-to-face sessions (through their trainer), as well as during the software-supported individual training sessions (through an online tutor).

Software-supported training can and should continue even after the official training phase, e.g. when a learner has the desire to repeat certain video-analyses because of a communication situation he or she has experienced. Thus, learners can freshen up their skills "just-in-time," one advan-

tage of such software-supported training that enables managers to employ their skills immediately.

As is shown by this training concept, learning with the help of new technologies can also play an important role in the area of soft skills—as long as it does not stand alone but is employed specifically as a didactic means and integrated into traditional learning scenarios.

Some Important Research Results from Studies with CaiManOnLine©

In the following, we will present some research results which indicate the usefulness of this tool.

Authenticity

In order to gain useful results for the further development of CaiManOnLine©, various scenarios were tested with respect to the design principle "authenticity." For this purpose, the degree of involvement of the learners was varied in a study with 30 participants (Henninger et al., 1999). One half of the participants worked on tasks with low authenticity, in which video-sequences with two actors were shown. The other participants worked on much more authentic tasks: they analyzed video-sequences with the same content, but in which they had worked alongside a coached actor. The surprising results showed that working on tasks which were judged to be highly authentic by the participants as well as the experimenter did not lead to a significant improvement in the learning results, while working on tasks judged as less authentic did. The positive effect of authenticity on learning is not questioned with this result. It can rather be deduced that a learner's participation in the video-sequences has undesired side-effects which have also been controversially discussed in literature. While some researchers expect positive training effects when the learners themselves participate in the video-sequences to be analyzed (see Günther & Sperber, 1993; Weidenmann, 1995), other authors point to possible disturbances which can reduce the learning gains (see Foppa, 1994; Frederici, 1998; Hayes & Flower, 1986; Hosford & Johnson, 1983). For the learning environment CaiManOnLine©, these results show that a medium degree of authenticity in the design of the learning tasks leads to the best learning gains (Henninger et al., 1999). This conclusion possibly reflects a domain-specific peculiarity in the fostering of communicative behavior: these are skills which are highly automated in everyday life and which are used very fast, thus unreflectedly. Therefore, it can be assumed that old automatisms are activated with a high probability in highly authentic

tasks—a fact which designers of communication training have to consider if they want to achieve long-term results (Henninger & Mandl, 2000).

Online Feedback

With respect to the further development of this computer-based training tool to a web-based training tool, other aspects come into the area of research. In a recent study (Viswanathan, 2002), the participants received feedback on their analysis in two training sessions with CaiManOnLine©. The question was, which medial representation of the online tutor and thus degree of social presence would be appropriate and show the best results? We found that learners who received audio-feedback only showed better learning results than those receiving feedback via video-conference with the online tutor. This result might indicate that additional video representation of the online tutor might not be necessary and that it might even distract the learners from paying attention to the audio-based feedback (Viswanathan, 2002).

Blended Learning Concept

The concept of training as a blended learning concept was also examined. We focused on the question of whether the combination of traditional, face-to-face training sessions with software-supported learning modules is accepted and judged to be helpful to the learning process. The results clearly show that both elements of the blended concept are accepted and, thus, that soft skills can be trained successfully with software (Henninger, 1999; Schlegl, 2001).

OUTLOOK

In this article we have shown that communication competence is an important skill for managers and that several aspects need to be paid attention to when designing a communication training concept. As demonstrated, a blended approach seems to be the best solution, combining the advantages of traditional face-to-face training and the possibilities offered by software and new technologies. With the help of didactically-designed software, traditional concepts can be optimized. However, it must not be forgotten that it has largely a supportive function. Face-to-face training cannot be replaced by it. A tool like CaiManOnLine© cannot stand alone but has to be integrated into a training concept.

With our blended learning concept we take into account that managers benefit most from training that fits their immediate learning needs on the job, that allows mobile learning and that does not overstrain their limited time resources. The conceptual design of the learning tool CaiManOn-

Line© allows flexible adaptation to the needs of the client. Therefore our vision is to offer this training concept for the education of managers and to do further research on the principles of communication training in the domain of management.

Following the arguments above, we assume that the successful design of new technologies for developing managers' communication competence should possess the following qualities, depending on the contracts of the training institution with the customer.

Interactive Learning

In contrast to their employees who work in teams, managers often work alone. Thus managers do not have the same possibilities to train their communicative competence inside a group of colleagues. However, training soft skills like interpersonal communication requires interaction with others in terms of feedback and coaching by trainers, as well as discussion with other participants. With regard to this aspect, a software-supported learning scenario should create a situation in which a manager should feel like he or she is part of a virtual learning group or a learning dyad with a coach. How can this be accomplished? First of all, the use of the training tool has to be integrated into a blended learning concept, as we have described above. In this kind of learning concept, software becomes an important element of the training as a basis for further training elements in the face-to-face sessions. Therefore, its use is obligatory and this important function of the training tool has to be made transparent to the managers. Trainers have to prepare them for the individual learning phases by establishing "the same or a similar level of knowledge in all the learners" (Henninger, Hörfurter, & Mandl, 2001: 14). Functions like E-mail, chat, voice and video allow easy communication with trainers, coaches or the learning team, e. g. in order to get and give feedback or to compare and discuss one's learning results. That way, individual learning becomes more motivating and exciting. But is this virtual learning interaction as accepted and efficient as face-to-face learning groups? An answer can be found by taking a closer look at theories and research on social presence and media richness (Daft & Lengel, 1984; Dennis & Kinney, 1998; Gunawardena & Zittle, 1997; Paechter, 2000; Short et al., 1976). Software designers have to take into account that communication competence is a highly complex task. According to media richness theory (Daft & Lengel, 1984), high complexity requires rich media, i. e. functions that allow synchronous communication and that convey a high amount of nonverbal cues, e. g. video-conferencing. The social presence theory (Short et al., 1976) postulates that the communication partner in a mediated communication situation is perceived more as a "real" person, the more nonverbal cues are available. This is an important aspect in a software-supported training, where such personal skills as communication are trained. A high degree of

social presence, furthermore, has positive effects on learners' satisfaction and motivation (Gunawardena & Zittle, 1997; Swanay Steffey, 2001). Thus, it seems sensible and necessary to achieve a high degree of social presence by the communicators in software-supported communication training, especially in coaching or feedback situations. In our studies on online feedback, we are currently exploring implications of social presence for learning with CaiManOnLine©. Beside this interactive learning, individual learning also plays an important role (see below).

Individual Learning

In online communication training, new technologies should allow managers to define their learning needs on their own. The learning tool should offer possibilities that allow learners to place emphasis individually on special training aspects and to adjust the frequency and duration of the learning sessions by themselves, depending on their needs and the time available. In order to foster individual learning, the following aspects of software design have to be taken into account. Henninger, Hörfurter, and Mandl (2001: 14) stress the fact that "[o]ne of the aims of learning software as a cognitive tool is to support the learner's reflection by reducing the cognitive load he/she is confronted with." In real-life communication situations, people feel that they have to react fast and if they want to reflect on the situation afterwards they have to remember a lot including for example, nonverbal cues as well as what has been said and how it has been said. Adequately designed multimedia learning environments reduce this cognitive load generally and according to individual learning needs. Therefore the software should allow the learners to watch video-sequences again and again, to choose special tasks that fit their actual learning needs best, to refer to online instruction when they want to look up some theoretical or instructional basics, and to compare their actual analysis with that of an expert. Adaptability of the software is very important for the trainers as well, because every training situation is unique, according to the needs, previous knowledge and learning habits of the participants. In order to fit the special needs of managers, a flexible and easily manageable training tool is required, and it is the trainer's job to offer the participants authentic learning situations, i.e. learning situations with contents relevant to the managers, such as conflicts with employees. Learning should not stop when the official training is over. On the contrary, it is essential that learning continues even afterwards.

Continuous Learning

Virtual learning should offer managers possibilities for ongoing learning. The initial learning group should be encouraged to reflect on their communication behavior in order to improve and stabilize their competences continuously. We suggest that only a blended learning concept as we have described it above can offer the necessary incentive for such a long-term

development. To reach that aim, coaching or at least the possibility to getting in contact with a trainer should be available to managers, e.g. in the form of asynchronous communication via email. During the official training period it is therefore necessary for the participants to get accustomed to communicating with the interactive functions of a learning environment.

Independence from Time and Location

Individual learning with the help of new technologies offers flexibility with respect to time and location. This point is of great relevance to managers whose schedules are often tight. Therefore, they need to be able to learn at home as well as at work, to learn spontaneously when they have time, when they are motivated or immediately after a real-life communication problem has occurred which they want to reflect on. This temporally and locally flexible learning is highly problem-oriented. Thus, successful transfer of learning results to real life becomes most likely. However, improvements of multimedia learning environments with respect to more flexibility depend on further technological development. Current technological innovations such as the implementation of a wireless LAN infrastructure in companies allow us to expect even more flexible possibilities for application in the near future, e. g. for mobile learning with CaiManOnLine© including all kinds of interactive functions.

Obvious Learning Results

A further point of relevance in the design of a learning environment for communication training are the learning results. Learning with new technologies should be designed in such a way that learning activities and results become obvious and more measurable than in traditional training concepts. That way, the cost-benefit relation is more transparent to the user—an important aspect for the acceptance of training. Multimedia learning environments offer the advantage of preserving learning results easily, which makes the individual progress of the learning transparent to managers and helps the trainers to give precise feedback. This implies that the software has to be user-friendly, i. e. the user-interface needs to be as self-explanatory as possible, clearly arranged and easy to comprehend. Otherwise it would distract the users from the learning contents, especially persons who are not used to learning with computers. Additionally, transparency should be fostered by an "accurate description of the subject matter" (Henninger, Hörfurter, & Mandl, 2001: 13) concerning explicit learning needs and objectives. It should be possible to implement criteria that are defined by the customer, i.e. the managers themselves. They should be able to decide learning objectives and criteria of analysis, in advance, as only if it is possible to define the objectives before, achievement can be measured exactly after training. The training tool CaiManOnLine® allows flexible adaptation of the criteria of analysis to the objectives of training.

Saving Time and Costs

The individual learning phases, with the help of new technologies, substitute part of the expensive and time-consuming planning, organizing, and accomplishing of face-to-face-training. Managers and trainers mainly save time, but also money on travelling and hotels and therefore gain more flexibility from blended learning concepts. Time and costs can also be saved by implementing tasks into the learning environment which have clear and transparent training goals, derived from theory. During these individual phases of learning the learners should get feedback and assistance from their trainers by online-coaching via E-mail, chat, audio, or even audio-video functions, as our studies show. Additionally, saving time and costs facilitates continuous learning after the actual training is over. Every now and then, the participants of the autonomous learning group might need short-term coaching from their trainer—a necessary support that sometimes even turns the balance to go on after problems have occurred in the learning group. This is quite easily manageable using interactive functions, whereas without these functions, an external coach could probably not maintain contact with different learning groups, at least not without exorbitant costs.

All in all, the results from studies on CaiManOnLine© confirm the fact that domain-specific peculiarities need to be taken into account in the design of such learning environments. Furthermore, there are many possibilities to be explored when using new technologies, e.g. how to give participants optimal support through online tutors in their individual software-supported training sessions. At present, studies are continuing on the various design principles of this training tool.

As illustrated above, all these points play an important role in the design of new technologies for developing managers' communication competence. When designing such a learning environment, the features named above should be integrated. Of course, it is the trainer's and clients' decision which of the features are actually employed over the course of a training. However, from an instructional perspective, it seems desirable to realize and utilize as many features as possible in order to design a blended communication training which is successful and highly accepted by the participants.

NOTE

1. Criteria of analysis can be freely chosen in accordance with the objectives of a training. The research on CaiManOnLine© is based on the three criteria by Bühler (1934).

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CHAPTER 8

MOBILE SCENARIOS Supporting Collaborative Learning Among Mobile Workers

Johan Lundin and Urban Nulden

INTRODUCTION

Both practitioners and researchers have increasingly emphasized the importance of competence development, training and education in contemporary organizations. Changing organizational demands have made work dependent on distribution and mobility, this has altered the possibilities for workers daily dialogue with colleagues. The context for this research is organizations of distributed and mobile workers and specifically those where knowledge is considered to be the most valuable asset. The term mobile worker is used to describe a person who is in some way physically mobile in their work. Workers in these organizations are naturally less likely to engage in unplanned meetings with colleagues than workers who are co-located. Unplanned meetings create the basis for informal sharing and creation of knowledge. In distributed organizations these issues are

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often neglected or, at best, formalized and planned. When becoming more distributed and mobile, organizations need new ways to cope with the competence development needs of the workers.

The argument raised in this chapter is that, due to these changes, conventional competence development needs to be supplemented by new approaches supported with distributed information technology solutions. As a contribution to this discussion this chapter shows how successful *stationary* educational approaches can serve as the basis for the distributed and mobile competence development. This is manifested in the design, development and evaluation of the Mobile Scenario Prototype (MoSP). In this chapter we use the term participant to describe a learner in a group using a scenario (Multimedia Scenario or Mobile Scenario).

Research on mobility approaches the term from a variety of angels. Kleinrock (1996) takes the perspective of *the mobile technology*. Luff & Heath (1998) describes the *mobile use of artifacts* as well as the *mobility of persons*. Dahlbom & Ljungberg (1998) describe the *mobile use* of technology. Belotti & Bly (1996) take the *mobility of persons* as starting point in their research. In this chapter the mobility of people, i.e. the mobile worker is the unit of analysis. The overall research approach is experimental on organizational, pedagogical as well as technological levels. The previous research presented should give a mindset for understanding mobile work and the demands that mobility puts upon technology. However, it gives much less support when looking at the actual design of mobile technologies, the transfer of pedagogical models for mobile learners and the understanding of the impact that these might have when used in organizations.

The MoSP is based on previous work with methods and applications for competence development in stationary settings, for example the Multimedia Scenarios (Nulden & Scheepers, 1998). The Multimedia Scenarios build on the idea of combining problem based learning, interactive multimedia, experiential learning, and role-playing. Multimedia Scenarios has been evaluated in various settings, e.g., higher education (Nulden & Scheepers, 1998), primary education (Nulden & Ward, 2002), and in corporate training (Hardless, Nilsson, & Nulden, forthcoming) and the approach has shown potential. However, difficulties were experienced regarding the learners' ability to find time to participate, although the Multimedia Scenario only requires about three hours, for two separate sessions. This problem in combination with an understanding of demands in mobile and distributed work inspired the development of a mobile Multimedia Scenario—the Mobile Scenario.

The technologies adopted in this research are wireless telecommunication networks and small, powerful handheld devices that give the mobile worker new possibilities to communicate, access data and information, at all times, as well as using various kinds of services online. These breakthroughs make it technologically possible to take part in planned or unplanned competence development activities freely, less dependent on

co-location and synchronicity. However, these technological advances will be of no use if they are not accompanied by the development of methods and activities for mobile learners. Accordingly the research question addressed in this chapter is:

How Can We Design Competence Development Activities for Mobile and Distributed Workers?

Consequently, The MoSP aims to validate the concept of the Mobile Scenario and find implications for further design of mobile learning. This will inherently examine the methods for finding implications for the design used. The chapter reports on the design and initial evaluation of the MoSP.

The remainder of the chapter has the following structure: The theoretical background is presented in section two followed by a description of multimedia scenario and the PIER (Problem based learning, Interactive Multimedia, Experiential learning, and Role-playing) approach. In section four the concept of mobile scenario is exemplified, and section five is the materialization of a mobile scenario through a prototype, MoSP. The next section describes the evaluation of MoSP, and a discussion. The chapter ends with conclusions and suggestions of further work.

BACKGROUND

This section discusses competence development in mobile work, and introduces the Multimedia Scenarios and the theoretical foundation (PIER) adopted in the design and development of the Multimedia Scenarios.

Sharing and creation of knowledge among mobile and distributed colleagues is crucial in professional practice (e.g., Wenger, 1998). Attempts to formalize and rationalize this sharing and creation have been less successful. From a pedagogical perspective, there are several organized approaches to learning from experience that can enhance and complement the learning that takes place in everyday work. PIER (Nulden & Scheepers, 1998) is the theoretical foundation for the Multimedia Scenarios, which is a *stationary* approach to help groups of individuals learn and share from their experiences. The limitation with Multimedia Scenarios concerning the participant's ability to take part in the stationary version, that is the Multimedia Scenarios, is the motivation for the development of the Mobile Scenarios.

Multimedia Scenarios is based on the methodological structuring PIER. In order to provide the reader with a frame of reference for understanding the mobile scenarios, below the four building blocks applied in PIER are described: problem based learning, interactive multimedia, experiential learning, and role-playing.

Problem Based Learning

Problem based learning (PBL) is a significant challenge to orthodox beliefs about education and learning (Margretson, 1991). PBL is "a way of constructing and teaching courses using problems as the stimulus and focus for student activity" (Boud & Feletti 1991). PBL is defined as "learning that results from the process of working towards the understanding or resolution of a problem" (Barrows, 1986). The starting point of problem-based learning is a real world phenomenon or problem that the learner wishes to learn more about. It is not simply the addition of problem solving activities to otherwise discipline centered curricula, but a way of conceiving of the curriculum that is centered on key problems in professional practice.

Interactive Multimedia

Multimedia for educational use has undergone a revolution during the last years, from simple drill-oriented programs to advanced simulations where students receive support for understanding complex matters. Interactive multimedia has been used to add dimensions, such as capturing the learners' imagination and visualizing processes, to various learning activities. Paper based case studies have been transformed into interactive case study simulations for individuals (e.g., Kendall, Kendall, Baskerville, & Barnes, 1996; Farrimond, 1997). IMM (Interactive Multimedia) applications have been used to enable individual learners to practice in a controlled environment, for instance a sales person can practice on how to deal with customers difficulties (Schank, 1997).

Experiential Learning

Experiential learning refers to an encounter that the learner experiences. From this encounter, learning is initiated. In experiential learning "the learner is directly in touch with the realities being studied ... [experiential learning] involves direct encounter with the phenomenon being studied rather than merely thinking about the encounter or only considering the possibility of doing something with it" (Kolb, 1984). Simulations of different types are the most applied way to conduct learning activities focusing on experience. Different types of interactive multimedia have often been used to support these activities (Graf & Kellog, 1990). Experiential learning views learning and human development as a social process based on experience. The emphasis shifts from learning in a classroom setting to learning through participation in social practice in the workplace, community, and society.

Role-Playing

There is a long history of simulations, games and role-playing in various educational contexts. Role-plays can be described as dramas in which a

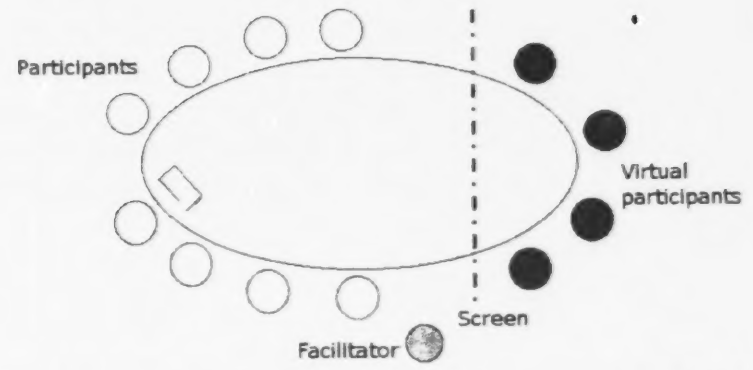
number of participants are asked to portray a particular character, but no lines are provided as for actors (Steinert, 1993). Role-playing is commonly used to prepare students for their future profession. Traditional areas of use are medicine training, law, policing, military service, and management. When acting in a role, individuals need to rethink their conceptions and understandings. We have also experienced that the possibility to put your differentiating views and opinions upon a role makes it easier to express them. Role-plays can in other situations be used to support the sharing of experience amongst the participants. The purpose and structure of a role-play can be to initiate reflection and discussions on issues directly related to a group of professionals, for instance project managers.

MULTIMEDIA SCENARIOS AND THE PIER APPROACH

The four building blocks discussed in the previous section serve as the foundation for the PIER approach that consists of the four sequential activities presented below.

Activity one—*simulated experience through role-playing with a Multimedia Scenario.* A group of five to eight learners are engaged in a role-playing activity as shown in Figure 1. The figure shows the basic setting of a stationary Multimedia Scenario with a group of learners gathered around a table, aided by a facilitator. During this time the learners experience a problematic situation presented with a Multimedia Scenario, which is relevant and realistic, and discuss the issues brought up. Figure 1 also shows the "virtual" group participants presented by the application on the large display. The activity lasts between two and three hours depending on the dynamics in the group, e.g., how eager they are to discuss and how intensively they role play.

The Multimedia Scenario is based around a story built up by simple and basic multimedia functionality such as hypertext, figures and pictures, sound and video clips. The group is navigating through the scenario following a sequence of hypertext as illustrated in figure 2. The group is confronted with information in different forms that require them to interact with each other and to decide on how to navigate in the scenario. In Figure 2 the basic structure of a Multimedia Scenario is presented. The story is made up of acts, each addressing a different issue for the participants to engage in discussion about. The participants are frequently asked to make decisions in the scenario. However, the outcome of the scenario is always predetermined. In Figure 2 each box represents a scene in the scenario. As seen in the figure the participants will always end up in the same scene



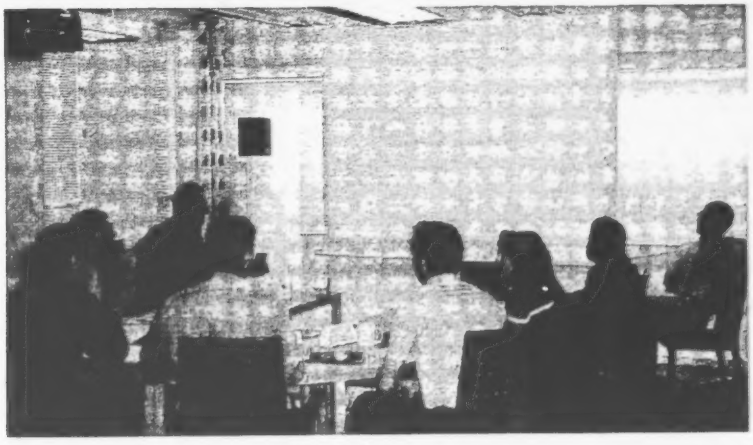


FIGURE 1
The Top Figure Shows the Basic Setup of the Stationary Multimedia Scenario. The Bottom Picture Shows a Group that Participates Synchronously in the stationary Multimedia Scenario.

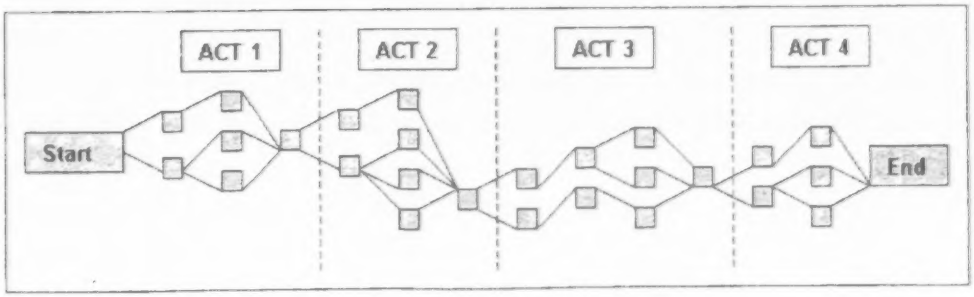


FIGURE 2
The Basic Overall Structure of the Multimedia Scenario. Grey Boxes Representing Scenes in the Acts. The Scenario is Based on Hypertext and an internet Browser is Used to Navigate.

(the right-most box in act four), meaning that the designers of the scenario are able to leave the learners with a final problem to work with.

This means that whichever decisions are made by the participants the consequence will still be the same. This in turn makes it possible for the designer to focus the scenario on a main problem and to be able to leave the participants with a key question. Hence it is important to emphasize that the scenario is not simulation *training* the participant to act correct. Rather it is a method to highlight complex questions and stimulate discussion in a context that is relevant to the participants, this without trying to provide the learners with an easy solution (which is something rare in managerial work practice). Activity one ends when the group is confronted with the final scene (denoted End in Figure 2). Here the aim is not to leave the group with a feeling of well-accomplished work. Rather the aim is to leave the group with a sense of failure and a problem on their minds, a cliffhanger. The group is abruptly excused and asked to return for a seminar a week later.

Activity two—*individual reflection for about one week.* After the first activity the group is dispersed and goes back to their ordinary work life. During this period each of the participants will have a chance to individually reflect on what happened in the scenario and they will be able to relate their experiences from the scenario to their daily work.

Activity three—*seminar where the scenario is discussed.* After this week of reflection the facilitator meets the group for a seminar lasting between two to three hours. The purpose is to discuss the experiences the participants encountered during their work with the scenario in activity one, and explicitly relate them to their experiences from daily work. A second purpose is to identify organizational changes needed to improve the organizations capability in problem areas similar to the problems covered in the scenario used in activity 1.

Activity four—*ongoing and organized learning processes.* Whereas activity one through three should be understood as mainly a starting point for learning, activity four is meant to be an ongoing and organized learning process taking place in the organization. This organizational learning does not take place automatically; rather it is a challenge for the organization (Hardless, Nilsson, & Nulden, 2001).

Design aspects

In the previous work with Multimedia Scenarios it was found that four main issues are crucial in the design of scenarios (Nulden & Scheepers, 1998):

- It is vital to use real world problems and relevant cases to engage the participants. The problems in the scenario should be generated from the organization where it will be implemented.
- Make sure to use variation in the scenario, both concerning content and the form of presentation.
- Layout and design do matter, not only for the interaction design but also for the whole learning activity. But the scenario does not have to use advanced multimedia functions.
- Provide the users with a feeling that the designer really put their heart into the construction of the scenario.

These four methodological design issues were taken into consideration when designing the Mobile Scenario. In addition to the above, the scenario should be designed to give the participants guidance without restricting the discussions. The group must be able and encouraged to make progress but within an area preset by the organizers of the learning activity. However, if the participating group would feel that their work did not impact the outcome of the scenario this would present a risk of loosing their feeling of responsibility and power in solving the problems posed to the group (Nulden & Scheepers, 1998). Considering the above, the three main objectives of the Mobile Scenario are:

- A driver of and guide for discussion
- The basis for initiating and structuring role-playing
- To be fun and stimulating for the participants

The PIER approach and the Multimedia Scenarios create the pedagogical base for the Mobile Scenarios.

THE MOBILE SCENARIOS

This section exemplifies the use of a Mobile Scenario, followed by a more specific description, and discusses aspects that the distribution, in time and space, has on the idea of using scenarios. To further exemplify, an illustration of one participant's use of Mobile Scenario is outlined below:

> Mona is the head of the network administration department at BIG-corp. Recently the company has been receiving critique from customers that, even though BIG-corp is delivering what is promised in the contracts, the customers are not receiving what they actually expect. Different department managers rarely get a chance to meet and discuss problems, and definitely not in a structured way. To address these issues BIG-corp decides to use a Mobile Scenario about customer relations. At the introduction meeting for the partici-

pants in the scenario Mona gets her login and password. She is quite busy with her work during the next days and does not have time to log in to the Mobile Scenario until two days later. Upon login she receives information about her role, she is appointed to take on the role of Project Manager Mike. Mike is working in a software development group at a big company. The company is just about to start developing a support system for an important government costumer. In Mike's background info Mona can read that he has had a less than positive experience working with the government. He has also heard from one of his colleagues at BIG–corp. that the company has promised the government agency that they will complete the project in less time than is realistically possible. Mike is not looking forward to work with this project. After reading this Mona realizes that she has to run off for a meeting. On the train back home that evening she logs on to the Mobile Scenario. Via the awareness function in the Mobile Scenario Mona notices that most other participants seem to be further ahead in the scenario. She knows that the group have to stay together to be able to advance and she does not want to be the person that the other participants have to wait for. She goes through what has been said in the discussion forums about the different issues raised in the scenario. It seems that there is some argument concerning how to deal with the problem presented so far in the project. She looks into the scenario and reads the information. The story starts out with a video clip where Mikes' supervisor explains that he has great faith in this new project, and that the relation with this customer is especially important. Mona moves on and is placed into the first meeting Mike and the others in the group have with the customer. The discussion seems to be pretty emotional already. The argument concerns how to manage the project, just as she read in the forums. The customer wants to have some specific people in the project that are not available at the moment. Mona receives more information concerning the issues of manning the project and finally the group cannot discuss more, they have to make a decision at the end of the first act. Should they go with what the customer wants, staff the project according to what the group find best or set up another meeting and compromise with the customer? When Mona reaches the decision point she realizes that she is the last participant to reach this last part of the act. She reads through the discussions and gives her opinion on the problem with the staffing of the project so they all can continue to the next act in the scenario. She logs off the Mobile Scenario just as the train pulls into her station. When shopping for supper she is thinking about her vote in the scenario. She let Mike tell the group that he thought that the project group knew best how the project should be manned and that this would be better for the customer too, even if the customer did not understand this. She wonders how the group and the customer will react to Mike's thoughts. She will log in again first thing after tomorrow's morning-meeting and see what has happened in the scenario ... and the story continues.

The Mobile Scenarios provides a group of learners with the possibility to engage in a structured mobile and distributed learning activity. The design of a scenario starts with discussions concerning what are the important and relevant questions for the involved organization and the participants in the

scenario. The idea is to create the scenario in collaboration with members of the organization to be able to incorporate portions of their specific culture and the language of the organization. When the story for the Mobile Scenario is written and illustrated with multimedia the new learners are introduced to the idea of Mobile Scenarios during a meeting and are given logins and passwords to the application. When a new learner enters the Mobile Scenarios she is appointed a role with a name and a position in the role-play (for example as in the case above a project manager in a fictional project). The learner is then given information on the characters' personality and history. A scenario starts with background information. The application has a built in awareness support so that the activity of all the online learners are visible. After the introduction the scenario story starts to build up a problem for the group of participants. A typical problem could be the work with understanding a customer's needs in the initialization part of a project. After receiving more information of the different aspects of the problem, they are all asked to address this problem. The story continues and brings the group together repeated times in decision situations creating "crossroads." The problems in the story escalate, both the complexity and the magnitude of the problems are increasing, which is creating more pressure on the group. The scenario ends with a final problem, which will ideally bring together all the different aspects in the scenario.

Mobile Scenarios will address the problem of distribution of participants both in time and space. Rather than participating for one three hour session the participants in the Mobile Scenarios will be able to participate for multiple short periods of time spread over a longer period. The learners decide when and where to participate. To stimulate discussion concerning events in the scenario the aim is to ensure the participants are in the same act of the scenario. This is accomplished by controlling the information available to the participants in synchronization points. The main approach is by, at specific points in the scenario let all participants agree in a question, before the group can continue. In Figure 3 the use of a synchronization point at the end of each act gathers the participants before the system opens the next act. Since the group will not be able to continue in the scenario until all participants have reached the synchronization point, this will create some motivation for the group members to keep moving forward in the story at a common pace. For the distribution of information in the scenario "cliff-hangers" are used. This by creating a suspenseful situation at the end of an act, making learners more eager to experience what will happen in the next act.

When using experiences from stationary competence development activities in the design of applications for mobile, distributed workers we stress the importance of understanding the context in which the application will be used. Designing mobile IT with implications and experience from desktop applications are often problematic (e.g., Luff & Heath, 1998) and also often results in unsuitable design solutions.

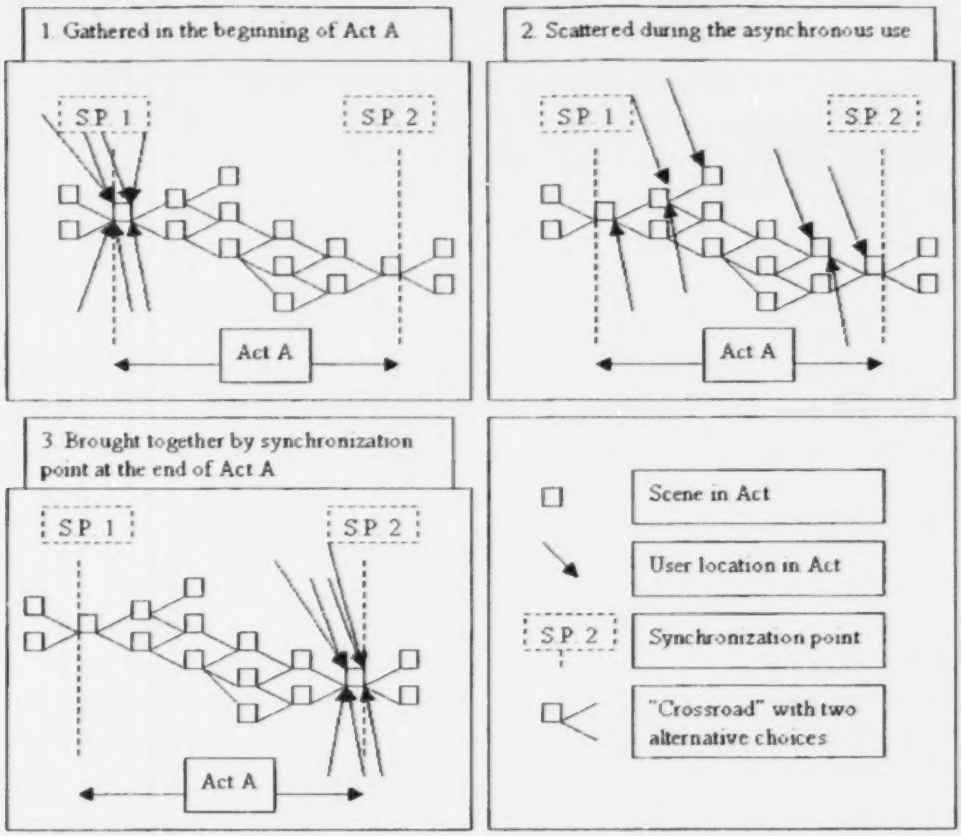


FIGURE 3
How the Participants Are "Forced" Together by Synchronization Points.

When looking for design implications in previous work with the stationary Multimedia Scenarios it is primarily a driver and a base for structuring and initiating discussion. To be a participant in a Multimedia Scenario is a collaborative, active and unpredictable experience. The aim is to preserve and if possible enhance the experience to make the learner feel as positive about the Mobile Scenario. The participants will not have the instant feedback from other learners as in the stationary setting where they are face to face. In the stationary Multimedia Scenarios, the initiation of discussions is mainly dependent on how well the scenario managed to create involvement among the participants. The facilitator also has the possibility to support the group and help them if the role-playing is not working well. To achieve this the scenarios must present problems relevant to the participants in a stimulating way. It is reasonable to think that this will be even more important in the Mobile Scenarios, when the participants are distributed in both time and place.

MOBILE SCENARIO PROTOTYPE—MOSP

To investigate the Mobile Scenarios as an idea of sharing and creating informal knowledge supported by mobile technology and role-play we use the MoSP. The MoSP makes it possible for us to evaluate the concept of the Mobile Scenarios in a mobile setting with six to eight simultaneous participants. The main objectives with the MoSP are to validate the concept of the Mobile Scenario and get implications for further design.

The stationary setting where people are face to face is highly suitable for discussion and direct interaction. The MoSP should provide channels for communication. Various media for communication such as voice mail, video chat, synchronous text chat, asynchronous text based forums, etc. were provided.

The MoSP is based around two main applications, firstly the VTD application (Video Transfer Demonstrator[1]) running on a mini-laptop[2]. And secondly the web-based scenario adapted for smaller screens, mini-laptops, and handheld computers. The VTD contains video chat as well as contact information about other users using the same application. This means that the users can be aware of the other group member's activity. For instance indications on who are online, and who is busy in a video conversation. This gives the person who is interested in initiating a conversation an indication of the receiving parties possibility to participate. The user gets information and can then decide when it is appropriate to initiate communication. The VTD includes a web browser displaying the scenario web page with alternatives for getting information about the background to the story presented in the scenario, an area for textual communication and sharing of files as well as the actual scenario (Figure 4).

EVALUATING THE MOSP

The aim of the MoSP is to validate the idea of the Mobile Scenario and get implications for further design. This means that we have to be able to express our idea of the Mobile Scenarios in a hands-on prototype and to investigate if the idea is comprehensible and if the potential users receive it positively.

The evaluation was performed in two steps. The first evaluation was held at a research lab with fourteen participants and the second at a workshop with seventy people participating. In both evaluations a combination of four handheld computers[3], four mini-laptops with built in camera for videoconference[4] and one EMIL[5] (a future concept platform to give the form factor of the use of a cell phone sized device) was used (Figure 5). The handhelds can be used while standing thus allowing somewhat more

mobile use. The mini-laptops were used at a table or held in the lap. All devices were connected through wireless LAN.

Three types of data were collected. First, each evaluation session was observed by two researchers who documented the activities. Second each facilitator was interviewed subsequent to the evaluations. The facilitators reported on the interaction they had with the participants as well as their observations of the use of the MoSP. In addition to this the discussions in the text forums in MoSP were analyzed.

Both evaluations had the same overall structure. They opened up with a ten-minute talk and five-minute video presentation that described the technology and the ideas behind Mobile Scenarios. The talk and the video

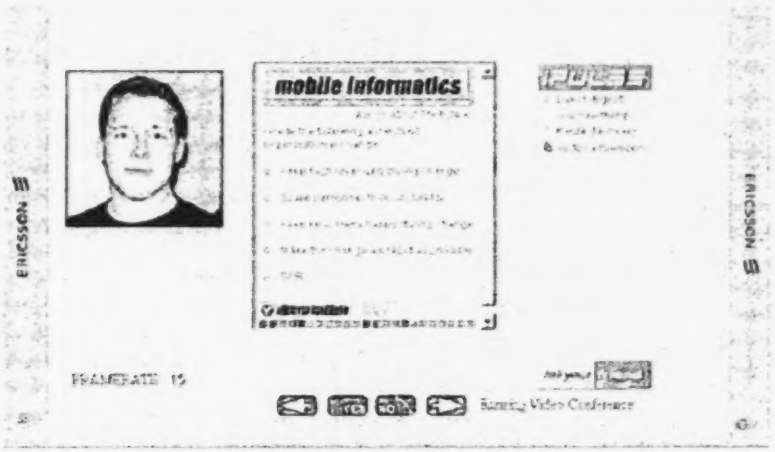


FIGURE 4
The VTD Communication Platform with the Mobile Scenario. To the Left, the Area for Video Communication, in the Middle the Scenario as Well as Area for Textual Input, and to the Right the Area for Awareness of Other Participants.

FIGURE 5
The MoSP Was Used on Handheld Computers, Mini-Laptops and the Ericsson EMIL Future Concept Device.

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served to present the participants the idea of mobile competence development and describe what they would be introduced to during the hands-on part of the evaluation. When the hands-on part of the evaluation started five facilitators were spread among the participants to aid them when necessary and to conduct the informal interviews.

The Evaluation at the Research Lab, February 2001

Fourteen people, 3 women and 11 men, were invited to participate in the first evaluation. During the testing, both network traffic and server load was measured to make sure that the response times would be fast enough to be an interactive experience through video conversation.

When the hands-on evaluation started the participants were a little puzzled at first. However with the help of the instructions provided in the web application and with help from facilitators they started to explore the scenario. Those participants equipped with the mini-laptops quickly started to record video messages and engage in videoconferences. The participants mostly seemed to appreciate the video conferencing possibilities offered and did not delve deeply into the contents of the scenario. However some participants engaged in a discussion about what kind of knowledge they deemed as appropriate to share in this manner. Most participants later turned to show substantial interest in the contents of the scenario. The group had software development expertise to some degree, which made this evaluation somewhat biased towards the technology behind the prototype and not so much on the methodology and content of the scenario.

The group was positive to the use of role-playing and the use of mobile technology as a way to create discussions concerning problems in their work practice. Most of the participants thought that this form of competence development could work for them and for their organization. There were also some problems during the evaluation:

- The instructions provided for the participants in the evaluation were inadequate.
- The scenario story was not elaborate enough and needed more information for the participants.
- The small screen sizes required extensive scrolling to read text.
- Technical problems with using video were experienced.

These issues were improved before the second evaluation session. Technical problems were solved, the scenario contained more background information, the instructions were more thorough and the text in the scenario had been broken into smaller sections to avoid scrolling.

The Evaluation at the Workshop, April 2001

The workshop evaluation engaged seventy participants with 20 of them taking part in the hands-on part of the evaluation. The workshop was held

at a human-computer interaction conference[6] and all participants of the conference were able to attend the workshop. No data concerning the background of the participants were collected during the evaluation. However, it is assumed that the participants were rather familiar with handheld computers. The evaluation started with an improved and extended talk and with some changes to the video presentation. The introduction video served to prepare the audience with some more background for the story in the scenario. After the video presentation eight facilitators walked into the audience with the devices handing them out to the participants. The limited number of devices and large number of participants required 2 to 3 persons to share the devices. During the hands-on evaluation the events taking place on one of the devices was projected on to a big screen. This was done to enable participants, not in the vicinity of a device, to follow what was going on in the scenario.

This time, being prepared with a better introduction, more thorough background and the introduction movie the users quickly engaged in the scenario. Some users started to discuss the Mobile Scenario as a tool for competence development. The main difference from the research lab session was that a majority of the participants immediately engaged in discussion concerning the topics and problems given in the scenario rather than discussing the technology behind the Mobile Scenarios. The fact that the MoSP created online discussion and role-playing is a positive result of the evaluation.

DISCUSSION

The MoSP was useful for gaining new knowledge on the validity and the design of the Mobile Scenarios. The two evaluation sessions gave an understanding of how users unfamiliar with this type of mobile competence development receive the Mobile Scenarios. In addition to this the design and development created new knowledge on the combination of competence development and small handheld devices. The work with the MoSP has been valuable as a tool for understanding and designing more full-scale applications within the area of mobile learning.

However the functionality that can be put into the small handheld devices available off the shelf today is not sufficient for real professional use of the Mobile Scenarios. To address this problem we have developed a distributed application, the Net-scenarios, that is used on stationary or laptop computers. The Net-scenario has been introduced to a group of learners in a full-scale competence development effort at an IT-consultant firm. This gives the opportunity to further develop the pedagogical ideas for distributed learners engaged in collaborative role-playing through multimedia.

CONCLUSIONS

This chapter has showed how future competence development for mobile workers can be designed and structured. There is a need for new ways of supporting the sharing and creation of knowledge among mobile and distributed learners. The research question addressed in this chapter is:

How can we design competence development activities for mobile and distributed workers?

A combination of pedagogical theories, stationary applications of competence development and an understanding of the design of mobile applications were applied in the design of the Mobile Scenarios. The Mobile Scenario Prototype, MoSP, was designed and evaluated. This gives two parts of the answer to the question; firstly the use of pedagogical theories from a stationary context and transformation of these into a mobile setting was successful. However, this has to be accompanied by an understanding of mobile and asynchronous use. Secondly the specific application, the Mobile Scenarios was found valid and useful by the participants in the evaluations, giving a concrete design suggestion for the mobile and distributed workers.

When designing mobile applications to support distributed learning it is suggested that the use of models from stationary competence development is an effective method. These models can be used to provide a base of evaluated ideas for further development and transformation. To incorporate pedagogical models, mainly grounded in work concerning stationary learning activities, gives valuable input for mobile design. However, we have to review models and theories in light of mobile use. This can be done both on a theoretical level but should be accompanied by testing in actual mobile use contexts.

We suggest a way of differentiating the design of learning models and new learning applications. In the design of future learning models, research should not be restricted by current technological possibilities. Rather we want to be able to freely work with new ideas and then look further at the possibilities for actual implementation. In application development, we have to look more into the technical boundaries.

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NOTES

1. Designed by Ericsson. www.ericsson.com

2. The Sony VAIO picturebook. A small lightweight laptop (1.2" x 9.9" x 6.0") with built-in camera.
3. The handhelds used were Compaq iPAQs.
4. The Sony VAIO picturebook.
5. Developed by Ericsson
6. CHI 2001 in Seattle.

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CHAPTER 9

GLOBAL MANAGEMENT EDUCATION
The Case of ERP Enabled Business School Programs

William D. Reisel and Edward F. Watson

This chapter describes how Enterprise Resource Planning Systems software has been integrated into business programs, how it is used in the classroom, the benefits of this technology to students, faculty, the university, and the business community. In the chapter, ERP is described, as is the university based structure that supports an ERP enabled business program. Critical success factors of an ERP enabled business program are identified and a case example from a university is presented.

Business educators are under enormous pressure to remain relevant to the business community that they serve. Deans at many of the top business programs in the United States have mandated top-to-bottom revisions of curriculum in order to better prepare students for the challenges of global management assignments. Firms have delivered a message that students, after leaving school, must be prepared to make critical judgments and

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decisions within a rapidly changing environment (Merritt, 2001). The business community wants students who have gone beyond a simple immersion in their area of concentration. They want students who understand how business processes work together and, moreover, how business processes yield competitive advantage (Hildebrand, 2001). Ultimately, businesses want decision makers who are capable of seeing how their own decisions are linked to overall firm-wide distinctive competencies and how these competencies yield sustainable competitive advantage (Meade & Rogers, 2001). Businesses want students that understand how information technology can help to produce and process knowledge (Schulz, 2001).

OVERVIEW OF ENTERPRISE SYSTEMS SOFTWARE

Enterprise Systems are a class of information systems that span the functional boundaries of an enterprise. They support integration of the business processes within an enterprise and are based on a common, organization-wide database. Enterprise Resource Planning (ERP) systems are a subset of Enterprise Systems that refer to the core logistics, financials, and human resource functions of an enterprise, prior to the availability of the Internet. ERP Systems are packaged systems that can impose standards and help manage processes in the organization. Companies that implement ERP Systems have the means to undergo radical organizational transformation or reengineering, guided by industry best practices that are designed into these systems.

Enterprise Application software (EAS) is the term that often refers to the packaged software itself, whereas Enterprise Systems refer to the combination of people, organizational processes, hardware, telecommunications networks, and software that use packaged EAS. Types of packaged EAS include: ERP, customer relationship management (CRM), supply chain management (SCM), e-Procurement, knowledge management (KM). EAS is available from a handful of software vendors including those that specialize in a single niche market such as Siebel (CRM) and i2 (SCM), versus the goliaths who attempt to offer most of the EAS components, such as SAP, Oracle, and PeopleSoft.

Figure 1 illustrates the general characteristics of an ERP: central repository of information (common database), broad functionality (solid cubes) with endless room for expanded functionality (empty cubes), deep functionality (inserted text), and integration. Figure 2 illustrates the components of an Enterprise Systems as depicted by a leading ES vendor (as a collection of enterprise application solutions): ERP (in dark circle), CFM (corporate finance management), KM (knowledge management), CRM (customer relationship management), BW (business warehouse), B2B

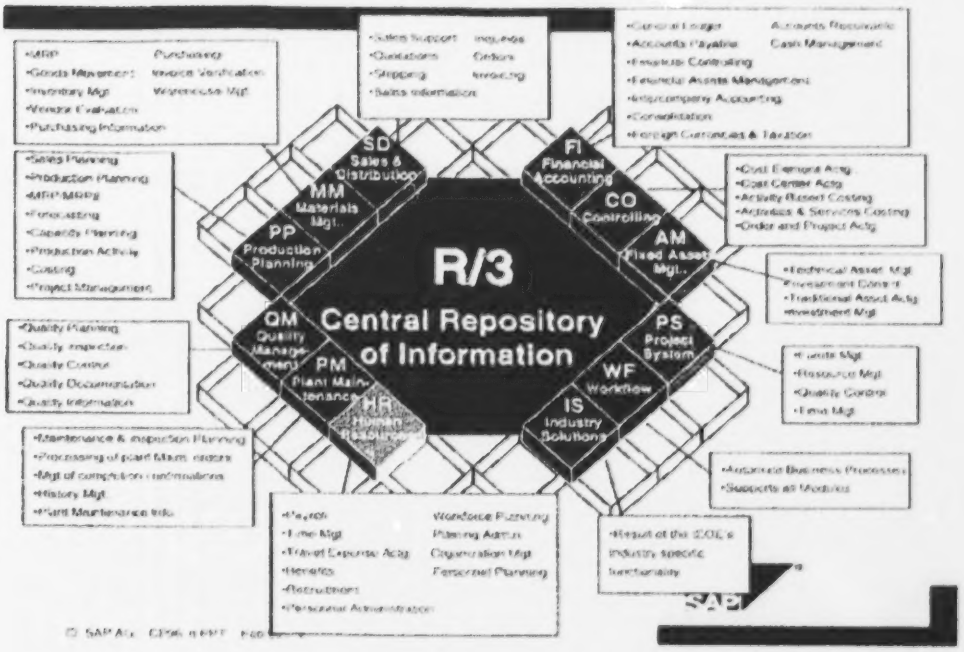

FIGURE 1
ERP System as Illustrated by Leading ERP Vendor, SAP AG (circa 1997)

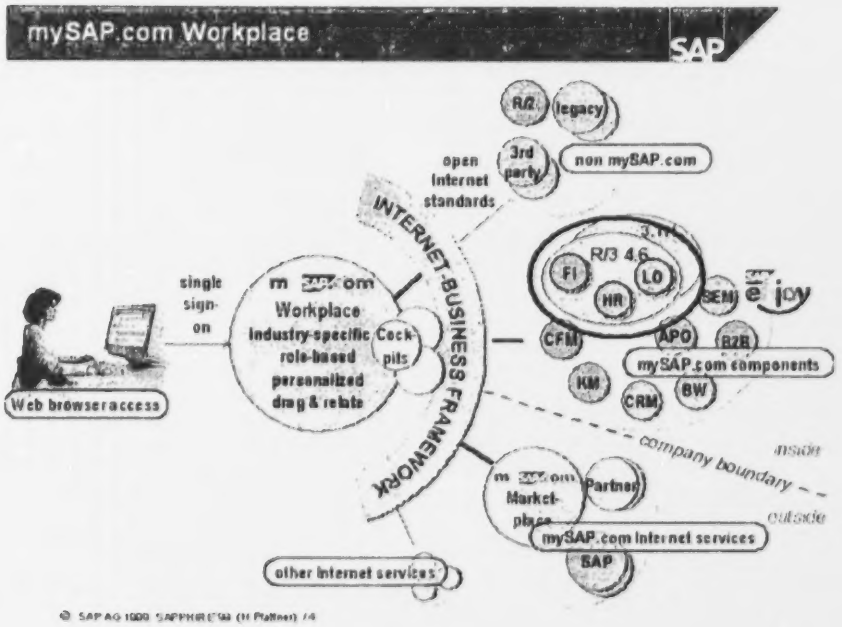

FIGURE 2
Proposed Enterprise System integrated suite as Illustrated by Leading Enterprise Systems Vendor and Thought Leader, SAP AG (circa 1999)

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(business-to-business), SEM (strategic enterprise management), and APO (advanced planning and optimization).

ERP is understood to be a transaction system. SEM is understood to be an Executive Information System. The CFM, APO, B2B, and CRM components might be thought of as Decision Support Systems. BW is the data warehouse. KM is the means to capture the brains of the organization (e.g., like an expert system but focusing on higher-level intelligence). The implementation methodology of SAP (referred to as ASAP) is considered to be the foremost and most widely used Expert System of all time.

Why is it Important in Industry?

Enterprise Systems and, more specifically, Enterprise Resource Planning systems serve as the core IT platform for many organizations. ERP systems are the foundation for streamlined and reengineered business processes that will ultimately empower an organization with the knowledge, tools, and processes needed to eliminate waste and position the organization for future growth and competition. The impact of these systems on organizations is profound, as best described by Tom Peters (2000) the former Principal of McKinsey & Company and renowned author of "In Search of Excellence":

> The White Collar Revolution is here. (Finally!) The White Collar Revolution will embrace—ready or not!—90+ percent of workers in the next 10 or so years. And most of us are **not** ready. It's elementary, my dear Watson. Most white collar jobs—as we know them—will disappear as we get the ERP/Enterprise Resource Planning—etc.—'stuff' right. You read that correctly, colleagues: 90+ percent. Gone. As in: Sayonara. White collar world circa 2004 is going to make "re-engineering" circa 1994 look like very small change indeed.

ERP vendors experienced rapid growth throughout the 1990s. By 1999, however, revenues for most major ERP vendors had flattened as market saturation occurred and capital spending to prepare for Y2K came to an end. Notwithstanding this dampening of the market, the 1999 market for ERP software and services was estimated at US$17 Billion, and is forecasted to grow to US$21 Billion by 2004 (AMR Research, 2000). ERP system implementation costs are often reported to be five to ten times the cost of software licenses (Davenport, 2000, p. 68). If this is the case, then organizations worldwide have spent close to US$90-180 billion on ERP systems in 1999.

Yet, with all of this intensive capital investment in ERP systems, few firms are using their investments optimally. A study conducted in 2000 by Benchmarking Partners, Inc. to look at how companies can make the most of

their investment determined that most ERP systems that were implemented prior to 2000 are only partially implemented and enterprise processes have not been sufficiently integrated.

How Does It Improve Upon What Came Earlier?

Enterprise Systems are believed to have solved a greater than forty-year problem that began in the early years of business computing: enterprise integration. The paradigm that contemporary organizations were built upon is the pyramid "chain of command." Divisions, Business Units, and Departments were defined in an attempt to capitalize on the efficiencies of the division-of-labor and economies-of-scale in a mass production society. Over time, simple processes became complex processes and layers of waste accumulated to the point of disaster, in the face of global competition.

In the 1970s and 1980s, the Total Quality Movement (TQM) captured the interest of business leaders as TQM gurus revealed the effectiveness of such practices as continuous improvement, statistical process control, quality circles and line-empowerment. In the late 1980s the business process revolution (BPR) captured corporate attention but was generally viewed as radical change, leading to workforce reductions, for deep-pocket companies. Business computing systems, such as MRP (material requirements planning and manufacturing resources planning systems) were touted as great systems that were almost impossible to implement successfully.

Then, in the early 1990s, Enterprise Resource Planning systems emerged as a solution to these business woes. These systems have a number of distinguishing characteristics: Integration, Common Database, Standardization, Best Practices, and Packaged Software. Integration implies that people can exchange information across the organization in real time (no more batch processing). Common Database means that the data in an organization has integrity (consistent, non-redundant). Standardization provides the groundwork for eliminating waste, communication across the organization, and economies-of-scale in procurement. Best practices serves to streamline operations, eliminate waste, and reengineer processes. Finally, the perception that the solution lies in Packaged Software reinforces the perception that 80% of what a business does (from a business computing perspective) is essentially the same across companies and, in fact, across industries. What is also apparent with a best practices, packaged software approach is implementation methodology. Not only is there a software solution that solves the problems of previous eras, but there is also a proven method for implementing these solutions in an organization. And these solutions, along with the appropriate implementation methodology, provide the structure for organizational transformation.

From an academic perspective, many business scholars are fascinated by the capability that these systems have provided business and government. Tom Peters, author of *In Search of Excellence*, says that future business enterprises will require leaders who understand how ERP systems are designed and implemented. These leaders will need to know how ERP enables change and how technology can be used to effectively enable business processes reporting and performance monitoring, optimization and strategic positioning.

With respect to Figure 3, it can be seen that in the early years of ERP, most of the interest in ERP was captured by four types of Faculty: Information Systems and Information Technology, Logistics and Operations, Accounting, and Human Resources. Overtime, as the solutions have broadened, there has been a more recent interest from other academic units such as: Finance (CFM, SEM), Marketing (CRM), Industrial Engineering and Engineering Management (PLM, Reliability), and Management (Change Management).

There are numerous pedagogical reasons for integrating ERP in the classroom:

Experiential Learning

To reinforce the concepts taught in class, students are engaged in hands-on exercises. In accounting, for example, students will work with actual data from the general ledger, balance sheet, and income statement and run and interpret various managerial reports. In operations, students will determine necessary input requirements to run MRP, how to interpret the results, and how to predict the effects of changing an input parameter.

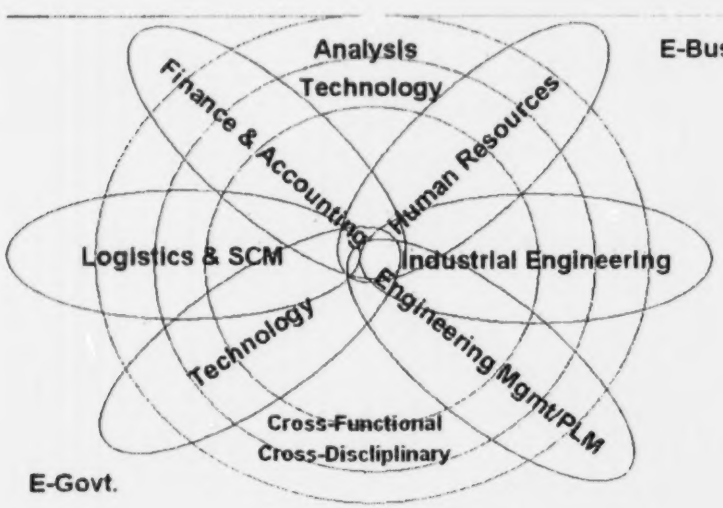

FIGURE 3
Enterprise Systems Curriculum

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In human resources, students will learn how an HR system is designed to support employee roles.

Real World Best Practices

The student using an Enterprise System in a classroom will encounter a hypothetical company to work with, decision support guided by industry defined best practices, and an on-line repository of business information. Students will learn: how organizations are represented in an ES in terms of organizational structures and business processes, and the kinds of standard and custom reports that are available to managers.

Business Process Integration and Cross-Functional Platform

There is no better way to describe business process integration than to show the transactions in an ES and highlight the integration points throughout the process. An ES, for example, illustrates all the steps and processes that begin with an order and end with an accounts receivables entry. The ES may serve as the platform for cross-functional case studies and curriculum.

Technology-based Curriculum

A curriculum that requires students to understand technology and utilize technology to improve their design and decision making capabilities can be a good thing. Technology-based curriculum is generally geared to delivering three kinds of students to the marketplace: the systems integration business consultant (responsible for implementing these complex systems), the enterprise application developers (responsible for expanding the functionality of these system), and the systems administration (responsible for maintaining the systems).

Implementation and Integration

The Enterprise System itself can be used in a mock implementation exercise where students define business requirements, develop a new process model to support these requirements, implement this model in an enterprise system, and simulate business transactions in their firm.

Enterprise Application Development and Systems Administration

The development and administration environments in an ES are rich enough to support enterprise application development and administration curriculum. The important features in this environment are the integrated nature of the environment and the many modules and database tables with which the individual must interact.

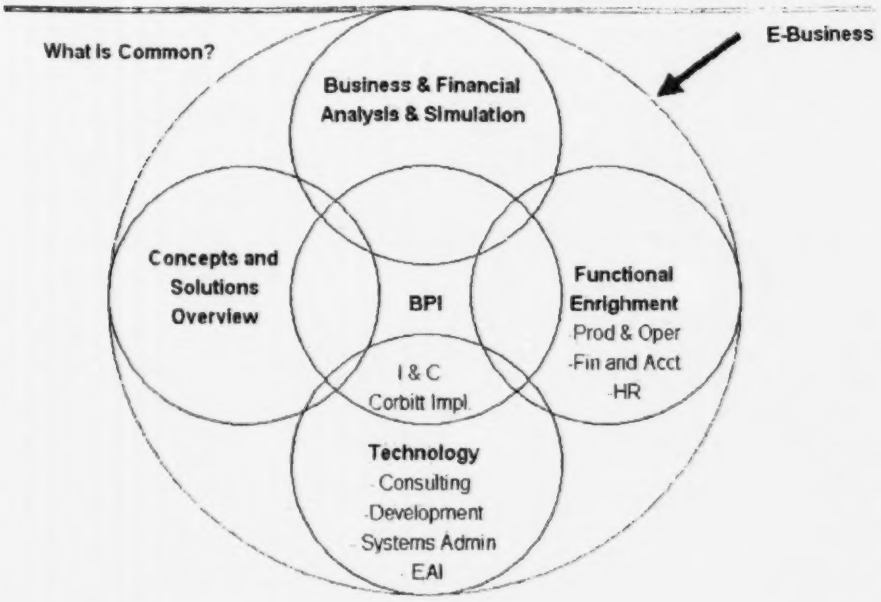

FIGURE 4

Most of the Enterprise Systems programs have one or more of the following 5 curriculum components as depicted in Figure 4. The component requiring no hands-on interaction with the system is referred to as Concepts and Solutions. At this level, students are presented a textbook approach to Enterprise Systems, emphasizing concepts and theory and viewing product demonstrations, web links, and various other resources generally available to the public. The Functional Enrichment component puts an emphasis on the support of existing classroom activities through the use of a real Enterprise System. Faculty build on their existing curriculum as opposed to reinventing new curriculum. A Business Process Integration component leverages the cross-functional nature of the EAS and leads faculty to demonstrate how the EAS can influence business processes and the organization.

Students have a competitive edge over their peers as they better understand the technology and decision making engines that will sit underneath most organizations in the next 5-10 years. The Implementation and Integration component will exploit the Enterprise System to enable a classroom to re-configure the system to take on the life of another hypothetical organization. In this component, the class may develop an organizational structure and a set of business processes, load the database with simulated corporate data, and define the reports that will be used to run the organization. Students exposed to this component will have a deep understanding of business process integration and will better understand how

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business operates as the transaction level. Finally, the ultimate tool for business analysis involves the Analysis and Simulation component. The multiple levels of learning help students to understand how business works while becoming familiar with important technology. This approach reinforces depth of the learning experience and is distinguished from industry-type training that focuses on menu-path learning in narrow functional areas.

It should be noted that academic approaches are different from training approaches by emphasizing conceptual issues versus process: "We suggest that one must understand the conceptual fundamentals of a process or a system, and this can be accomplished through the integration of an ERP system and its concepts into a business school curriculum. In turn, industry must adopt a more process-oriented approach in its ERP training programs" (Boykin & Martz, forthcoming). Ultimately, ERP based learning contributes to overall understanding of processes that are common across businesses. Students will see the connection between what a business does and how its information system is designed to support it (see O'Leary, 2002).

CRITICAL SUCCESS FACTORS

Implementing an ERP program at a university requires careful planning of the project. Because the project will draw on resources that cross-departmental lines and will require administrative approval, the first step of implementation is to secure buy-in from the many contributors to the project. Key to this is the development of a carefully written business plan. It is important that the author be among the faculty ranks as ERP training is time consuming and ultimately it is faculty who will be using it in the classroom. Therefore, the impetus to move an ERP program forward resides in the hands of one or more interested faculty members. This can be problematic as faculty incentives are often more closely aligned with research than with teaching (Becerra-Fernandez, Murphy, & Simon, 2000).

The business plan helps a university to outline its overall goals for the program, the resources that will be required, and who will participate. It is also a basis by which the university may approach a supplier of ERP software such as Baan, Oracle, PeopleSoft, J.D. Edwards, or SAP to request a grant of their products and other necessary technical support. Generally, the software supplier will offer guidelines that assist the university in identifying the full set of materials and resources that may be required to install ERP software. The university must identify the courses and faculty who are expected to participate in the program.

The components of a good ERP business plan include the following:

Statement of Purpose

What is the overall intention of the program? Generally, this is a high-level mission statement that addresses the intention to deliver state-of-the-art education using the latest technology available.

Statement of Responsibilities

Since this document will be reviewed by faculty participants, administrators, and the software partner, make the responsibilities of all concerned very clear. This is extremely important when it comes to accountability as the program reaches various milestones. Usually, this section identifies the broad requirements from all participants without specifying associated costs. It is useful to identify all departments with interested faculty and the courses that are expected to introduce ERP. Sound plans also identify the infrastructure of support such as introductory courses on the software, the funding of the courses, the technical support from internal personal (both instructors and information systems personnel). Also the liaison to the software provider for solutions to technical problems that cannot be resolved internally.

Listing of Resources

The business plan should carefully identify all needed equipment and network support requirements. Generally the software partner will offer a high level blueprint for physical resource requirements. There are at least two models that may be considered. The first is a dedicated model in which the university acquires the needed hardware and software and operates it over its existing network. Because of the intense demands placed upon a dedicated system by a wide student user base, it generally requires the university to provide a standalone server with potential to grow as needs increase. A second model that is becoming popular is to utilize web-based system that is hosted by a third party. Users gain access via ID login with password protection. This model is particularly useful at universities where information systems support is difficult to procure. In this model, support is no longer a challenge for the university as the host manages it.

Training of Faculty

The success or failure of the program is ultimately in the hands of the faculty. Because ERP software is frequently complex and time consuming to become familiarized with, a detailed training plan should be identified up front. This includes naming those faculty who will receive basic ERP training and also faculty who will receive follow-up functional area training courses. The commitment of each faculty member is based, foremost, in their interest. However, sensible administrative strategies can assist the training plan. It is advisable for administrauon to consider incentives such

as release from teaching, monetary bonuses, and consideration with respect to tenure for involved non-tenured junior faculty. Additional funds for the training of new faculty by existing faculty can help to expand the knowledge base as faculty climb the ERP learning curve. Also, it is advantageous to secure a pool of resources for training of teaching assistants who can be assigned to computer laboratories to help students as they work on ERP projects. The ERP software provider should also offer curriculum assistance that helps faculty to see how ERP can be introduced into the classroom, including exercises and access to faculty at other institutions who can be helpful.

Budget

The business plan should identify all associated costs of the program. These include hardware costs, training costs, travel costs, support personnel, faculty incentives, and third party technical support as needed. Given the costs of an ERP program, the budget is extremely important for internal administrative support. Administration will not buy-off on an ERP program unless they are fully aware of the financial exposure. Programs that generate their own resources via external grants are likely to be viewed favorably by administration and reduce the need for annual funding requests.

Once the approval for an ERP business plan has been received, the program can benefit by seeking to solicit business partner support. Because ERP skills are valued by industry, it is useful to develop a network of business leaders who are interested in the program and who may give some of their time to advise the university. A business advisory board can help to add credibility to the program and to build a bridge from the classroom to the job market. Ultimately, students will want ERP skills if they see the connection between gaining these skills and getting better-paid entry-level positions. Businesses will come to actively recruit ERP students as it reduces training costs and gives them access to students who understand fundamental business process concepts.

BENEFITS TO STAKEHOLDERS

There are many stakeholders of an ERP enabled business curriculum. These include students, faculty, university, and the business community. The most important stakeholders are the students. By integrating ERP technology into classroom teaching, students are exposed to the latest information system technology. Further, ERP creates a structure that illustrates the concept of cross-functional business processes. This is important

as university students typically major in one of the functional areas of business (i.e., marketing). This often carries over to work environments where employees specialize in narrow functional areas of the business leading to what has been termed 'silos' of knowledge (Sandoe, Corbitt, & Boykin, 2001). Silos have the effect of isolating important organizational knowledge rather than making it available, interpretable and useful outside of the silo. Thus organizations with silos are likely to be inefficient because decisions will be poor, and time will be wasted.

The ERP enabled classroom takes students from all functional disciplines of business and teaches them how actions in one area of the business influence other areas of the business. Management operations students, for example, see that increased production output to meet increased demand may or may not increase profitability. By understanding the supply chain costs, operations students can determine the impact of supplier costs upon the bottom line. The operations student therefore draws on both supply chain and accounting information to evaluate performance in their functional area. Thus an ERP system demonstrates the inter-relationships of business processes across functional areas.

From a traditional learning perspective, students gain exposure to technology that is becoming widely utilized in medium- to large-size businesses. This is important to firms that value ERP training in their new hires. Further, ERP exposure helps students develop adaptive and innovative learning styles (Kirton, 1976). Data access and query capability helps to improve student ability to adapt by identifying and solving existing business problems. Knowledge management tools help students to use their innovative capacity by finding new patterns, opportunities and means of innovating.

The student as stakeholder of ERP enabled business curriculum also increases her competitive position in the job market. Firms are able to hire students who are conversant with ERP technology and are prepared to make rapid contributions to the firm. Firms save on training costs and get productivity out of their new hires more quickly. Students also receive higher initial salaries than comparable students without ERP skills.

Faculty are another stakeholder group that benefits from ERP enabled teaching. ERP enabled programs are technologically advanced and require continuing professional development on the part of faculty. This helps faculty to remain current in their skills as industry continues to advance and place new demands on the academic community. Further, faculty often work in teams to teach ERP courses and this builds faculty rapport, collaborative opportunities, and cross-functional cooperation. Additionally, faculty of ERP programs often work cooperatively with colleagues of other universities furthering the opportunities for learning communities, research, and enhanced professional development. Also, the business community frequently utilizes faculty for consulting opportunities as their ERP expertise increases.

The university benefits from ERP enabled business programs from a number of perspectives. Academically, the university is positioned to offer technologically sophisticated course offerings. This lends itself to marketing on the basis of distinctive competencies and the prospect of attracting highly qualified students. Further, as ERP technology develops in the university course offerings, the programs may be used to attract gifts during university development outreach.

Last, the business community benefits tremendously from ERP enabled business programs as they are able to actively recruit students who understand ERP and the cross-functional nature of business operations and decision-making.

Ultimately, this initiative must be embraced at the faculty level. This will require more work than one can expect to be rewarded for. It will add an additional load onto to existing research, teaching, and service initiatives. Faculty will need to be personally motivated to justify the time and effort required to be successful in a program that utilizes a real-world information system to enhance education. For example, the authors would argue that there are at least six areas that faculty can benefit through participation in these initiatives:

- Education is what these initiatives are designed to impact first. Success is critical and not guaranteed.
- Research initiatives in the enterprise systems area are likely strengthened if faculty have a deeper awareness of how these systems are designed, how they are used effectively, what their actual functionality and capabilities are, and how they are most effectively adopted and diffused throughout a (global) organization.
- Professional Development is likely to occur if faculty is engaged in programs that offer professional development events such as a CEO roundtable, a research congress, and other company sponsored events that bring academics together with business leaders and industry analysts.
- Academic Networking is required when engaged in an initiative that demands so much time. Sharing and collaboration is most effective in a global environment when there is a real business purpose and when academics and practitioners on all continents are challenged by the same problems.
- Academic Leadership will result when faculty identify new areas of opportunity surrounding the Enterprise Systems areas, and engage in workshop and conference activities that build on the shared interests of other faculty around the globe.
- Consulting opportunities will likely increase when a faculty develops their knowledge and expertise in an area that holds the interest of business and industry leaders.

The buy-in of faculty is most critical, but other stakeholders may indirectly influence a successful program through various means. The business community will work with faculty to help identify important components of enterprise systems education; both knowledge and skills. The business community can also work with faculty to increase effectiveness of recruiting efforts, to offer student internships and coops, to collaborate on classroom projects and serve as guest speakers, and to offer special opportunities in consulting or internships for faculty as perhaps the most effective way to impact the classroom as a whole. University administrators can also provide perks, compensation, and course-load reduction for faculty who are engaged on these initiatives. Students can also play a role by encouraging their faculty offer Enterprise Systems courses. Academic colleagues can play a role by communicating the importance of this work to students, administrators, and the business community.

ERP PROGRAM AT ST. JOHN'S UNIVERSITY

In the fall of 2000, St. John's University of New York partnered with SAP America Inc., the market leader in Enterprise Resource Planning systems. This partnership allowed St. John's University to join SAP's University Alliance Program (UAP). This entitled St. John's University to SAP's ERP product, SAP/R3 (Release 4.6). R/3 is the leading ERP system on the market today and is valued in excess of $2 million. The reason for the transfer was to offer the university the opportunity to expand its technological capability in the use of ERP software. The UAP creates innovative corporate and educational partnerships with R/3 being used as an integrative teaching tool. Students receive comprehensive, real-world exposure to business information technology and, ultimately, a competitive edge in the job market. SAP expects that such prepared business students will move business from a single-function orientation to a more comprehensive, process-driven approach with a strong customer focus.

The University/Industry Model

There are three stages of the ERP integration plan (see Figure 5):

1. the grant application,
2. faculty collaboration and training, and
3. implementation of the curriculum.

These will be described in turn.

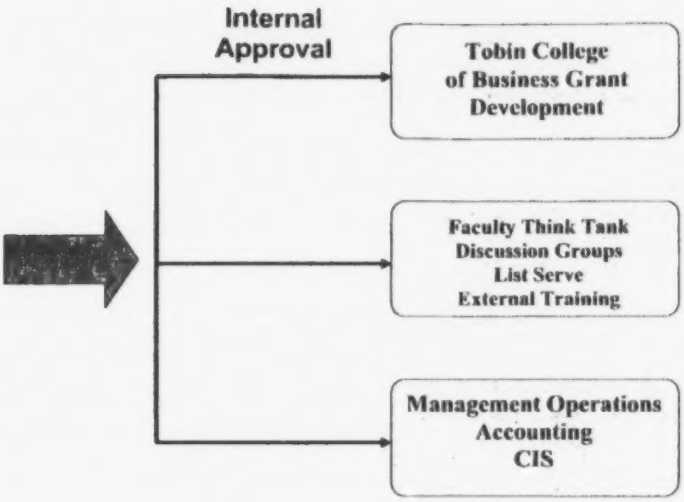

FIGURE 5
Planning Process to Integrate ERP into Business
Curriculum at St. John's University

Grant Application

SAP fields grant applications from universities with established business programs. The grant process takes several months and requires input from SAP and several key areas of the applicant university. The key areas of the university are the administration, information technology, and the members of the business faculty. The grant details the commitment on the part of the university to support its R/3 installation. SAP offers universities R/3 in one of two configurations: (1) stand alone on a dedicated university client-server and (2) hosted application that is accessible via the worldwide web.

St. John's elected to install R/3 on its own dedicated server. The grant also identifies key courses in which R/3 is expected to be integrated. The grant application is reviewed and approved by SAP. Once approval is received, an installation may be scheduled with SAP. The lead-time before installation may be as much as several months.

Training Faculty

The need for faculty training cannot be underestimated. SAP offers training at regional training centers throughout the world. Understanding how SAP works requires an intensive investment of time on the part of faculty. SAP's first course (SAP01) requires a commitment of 3, eight-hour days and this course simply describes the overall structure of the R/3 system. SAP professional trainers tell their trainees during this course that the

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software entails tens of thousands of screens and that no single individual fully knows all of R/3. Most experienced users only specialize in one functional area of the software such as accounting or logistics.

SAP also hosts curriculum conferences that bring together faculty and professional trainers for weeklong sessions that focus on R/3 content and curriculum. Several universities have received Centers of Excellence distinctions from SAP and are sharing their insights and curriculum with UAP members.

Curriculum Integration

Figure 6 outlines the modular structure of SAP R/3. The comprehensiveness of R/3 offers pedagogic opportunities to business faculty. R/3 can be used to directly illustrate how functional areas of a global business work together. Students are introduced to the concept of the "Client" which is SAP terminology for the overall structure and scope of the firm. The client is structured at the outset by configuration specialists who set up the numerous accounting and operational relationships within the firm and its single or multiple operating units. Students learn how to navigate in the R/3 environment and how to designate unique user settings such as language and currency.

Faculty from different departments can show how transactions such as selling, purchasing, production, and accounting integrate. Planning and forecasting are components of each of these areas. An action in one area can be understood in isolation or by its impact upon another area. Further, concepts such as purchasing, for example, are demonstrated with a level of

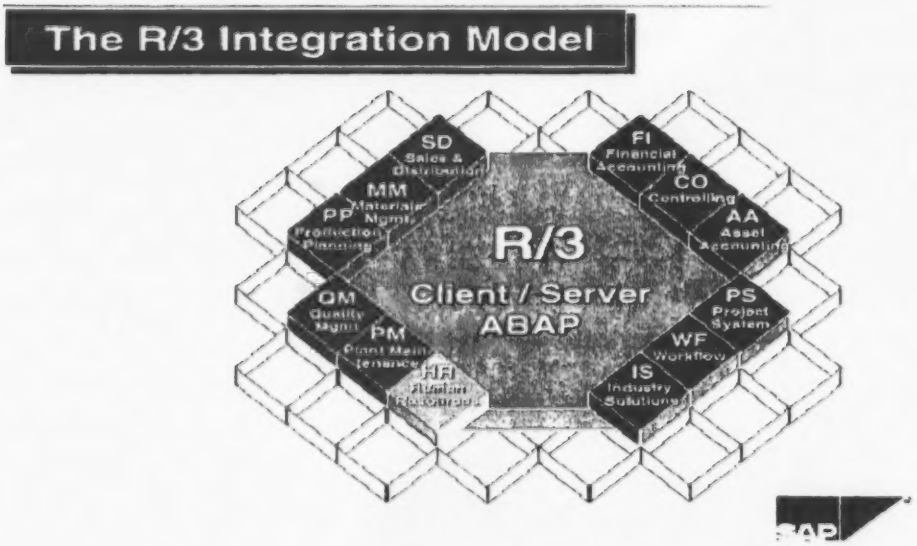

FIGURE 6
R/3 Structure. *Source:* SAP's R/3 platform, SAP America.

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hands-on-realism that is not apparent in strictly theoretical treatments. Students can see how a purchase order is actually conceptualized and issued. The purchasing process complexity is illustrated by the many ways in which the purchaser can generate a purchase order:

1. by reference to master contracts,
2. by reference to a requisition or a sales quotation,
3. on an open P.O. by quantity or value,
4. by authorized or unauthorized supplier, etc.

Further, the receipt of the purchased material can be held for inspection or for a department; it can be received on a valued or nonvaluated basis. Purchasing is linked to production to establish acceptable lead times for timely delivery to customers of finished or semi-finished products. Thus, the student of supply chain management is grounded in both theory and application. Further, the student is able to conceptualize business processes across more than one operating area. This supports integrative thinking that is essential to business survival and is a skill set that is desirable to human capital managers in the business community.

Value to the University

The immediate benefit and value to the university of integrating ERP software into the classroom is multi-level learning. First, students get both theoretic and transaction-based learning experiences. Second, business/academic partnerships are formed in which students enjoy service learning opportunities via internships and then paid part-time and full-time positions (Kenworthy-U'Ren, 1999). Third, cross-departmental collaboration between faculty leads to multi-disciplinary research and improved esprit de corps. Fourth, the program is an excellent development opportunity via grants and alumni sponsorship. Fifth, a commitment to the technology learning curve improves faculty skill sets. Sixth, university reputation is enhanced as students fulfill the promise of economic advancement that comes with completion of a degree program.

This program offers an additional value to the university in that it is consistent with the growing trend in Information Technology management to bring together best of breed technologies. SAP America is rapidly changing to a web-enabled and hosted environment in which SAP offers its customers open-architectures (Kontzer, 2001). In this way, users of SAP can draw from R/3's strengths while turning to third party Application System Providers (ASP) for software that betters serves specialized business purposes (Songini, 2001; Tripoli, 2001). Thus, the university is offering its students the most current approaches to Information Technology strategy,

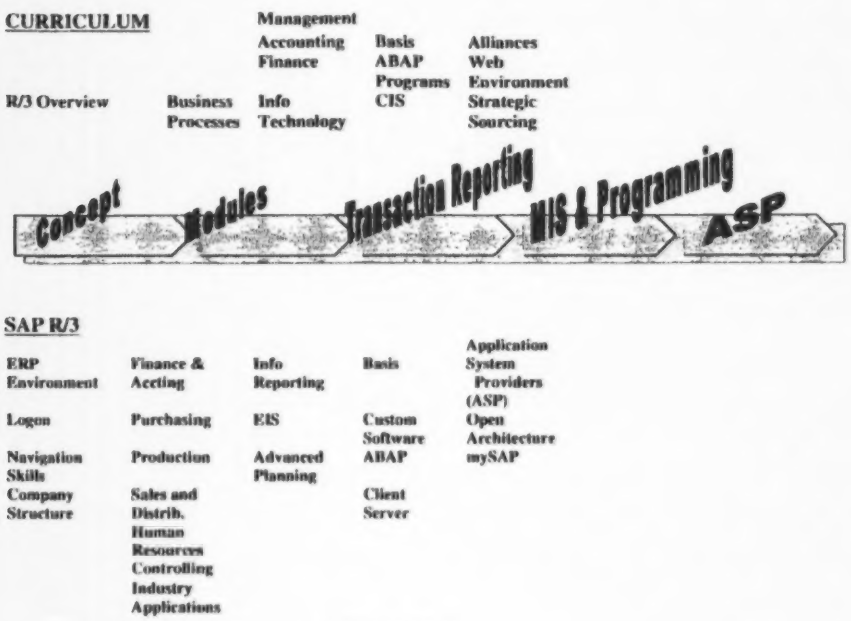

FIGURE 7
Curriculum/ERP Continuum from Concept to Open Architecture

sourcing, and interconnectivity. This is critical as students will need to make important decisions about technology of choice as their authority and responsibility increases (Martins & Kambil, 1999).

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CHAPTER 10

FROM VISION TO REALITY A Model for Bringing Real-World Technology To The Management Education Classroom

Michael D. Hamlin, Charla Griffy-Brown, and James Goodrich

Business Schools in the 21st Century must be responsive to the rapidly changing business setting—both culturally and technologically in order to remain competitive (Galbraith, 2002; Durlabhji & Fusiler, 2002; Merritt, 2002). Many business schools see a need to react to growing technology use in business and want to provide their students with access to these management tools to put them in sync with business practice (Katz, 2002; Strauss, 2002). Unfortunately, university environments do not foster change, particularly technological change that is commensurate with the marketplace (Blustain, Goldstein & Lozier, 1998, Curry, 2002;). Nor do they generally have the resources, market incentives, or skills for technology planning that are available in private industry (Curry, 2002; Lightfoot & Ihrig, 2002; Daigle & Cuocco,2002).

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This chapter will make the case that though it might be that schools and colleges are limited in planning resources or experience in technology planning, they need to develop and practice skills in project management techniques and be as rigorous as the for-profit sector in their technology planning (Ely, 1990; Hartman & Ashrafi, 2002). To make this case we will describe how the Graziadio School of Business and Management adopted a project planning technique that we have dubbed the *SMART* planning process. SMART is an acronym where each letter stands for a stage of the planning process. Stages include:

- *Structure*—Create a project framework for planning and information gathering
- *Map*—Create a technology planning roadmap to guide the planning process
- *Assessment*—Assess and analyze the technical infrastructure and user needs
- *Recommendation*—Make data-driven recommendations
- *Technology Action Plan*—Turn the recommendations into technology initiatives

It may be that for your particular technology need you can appoint a small group to go ahead and draft an implementation plan and carry it out. For many projects, a small group can make the necessary decisions as long as they have administrative support for implementation. But for any sizable projects or those with wide user impact your school should review your *total* technology environment and how your project will fit in to that environment. With some analysis you may find that your technology environment is insufficient to support the new technology you want to implement or that it cannot help you reach your long-range technology goals. In such cases you will need to make adjustments or revisions in your technology infrastructure to make sure it will support whatever new project you are trying to implement.

This chapter will describe how the Graziadio School—starting with the very simple notion that technology could enhance delivery of instruction and improve school business processes—used the *SMART* planning process to assess its overall technology infrastructure to produce a technology action plan. Although the school's initial goals and desires were vague, the SMART planning process gave us the insights we needed to make a number of systemic changes to ensure successful technology deployment.

We will begin by describing the SMART technology planning process and providing details about how we proceeded and some suggestions for how other schools and programs might adapt it. Our SMART planning process identified several technology initiatives that were needed to improve teaching, school business processes, marketing, and outreach. We will outline the process we went through to implement just one of these initiatives—a corporate portal solution to improve access to academic and

administrative information and streamline school business processes. Finally, we will share a list of lessons we learned in our planning and implementation process and provide an overview of where we are hoping to take our portal and the type of assessments we are planning. Readers will find a technology planning checklist based on the SMART process in the conclusion of the chapter.

WORKING SMARTER

The School administration along with many others in management education (Rath & Gaudet, 1998; Vinten, 2000; Lincoln, 2001) had a general sense that information technology could be used to improve business processes, communication among students, faculty and staff and improve the delivery of management education. Unfortunately, the school was not positioned to take advantage of new technology. Although there was a desire to use new technology there was neither real technology vision nor a solid sense of direction. The school had made some progress in the introduction of new teaching technologies, but integration of technology into the Graziadio curriculum was not proceeding quickly, partially because the school did not have a large technology staff nor was it experienced in technology planning.

Even though faculty were not entirely opposed to new technology there was a perceived conflict with the school's traditional teaching values. Partly because some faculty were convinced that technology would only detract from the school's traditional strengths and partly to augment its technology expertise the school administration turned to an outside consultant to insure a fresh and unbiased assessment (Walker, 1997; Brown, 2000; McDonald & Simpson, 2001).With the help of the consultant, the school developed a technology planning process, which though extensive can be illustrated by use of an acronym—*SMART.* The SMART planning steps:

- *Structure*
- *Map*
- *Assessment*
- *Recommendations*
- *Technology* action plan.

have three general technology planning goals:

Organization

Ensure that there is a mutual understanding of the project, its scope, the schedule, and desired outcomes.

Assessment

Development of a vision for a more sophisticated IT environment. Conduct interviews and focus groups to identify potential benefits. Conduct a high-level review of existing IT Infrastructure.

Recommendations

Evaluate opportunities presented, and then draft recommendations to take advantage of these opportunities. Develop a rationale and high-level implementation plan.

CREATING A *STRUCTURE* FOR TECHNOLOGY PLANNING

In the **Structure** phase of the SMART planning process the emphasis is on the creation of a framework for technology planning and needs assessment. The goal of the **Structure** phase is to create an organization and timeline for planning and to give the process some direction. The steps include:

- Establish a planning group structure,
- Define the scope and approach of the project,
- Draft a project plan and timeline,
- Decide who to interview and schedule interviews and focus groups, and
- Develop a plan to keep the organization informed

PROJECT LEADERSHIP AND COORDINATION

In the first phase you should plan to establish an organizational framework for planning, information gathering and communication to the rest of the organization. The most important element of this structure is the school project sponsor or champion (Wreden, 2002). As with most projects of this size and complexity, a high-status leader or champion is critical. The higher the status of the champion, the more easily he or she can deal with the inevitable political and bureaucratic hurdles that occur in any sizable institution. In our case the champion was the Dean, who was immensely helpful in insuring the successful completion of the project.

To insure proper attention to detail and to keep the project moving steadily the school assigned two of its technology managers to coordinate the project with the consultant. The availability of project managers to

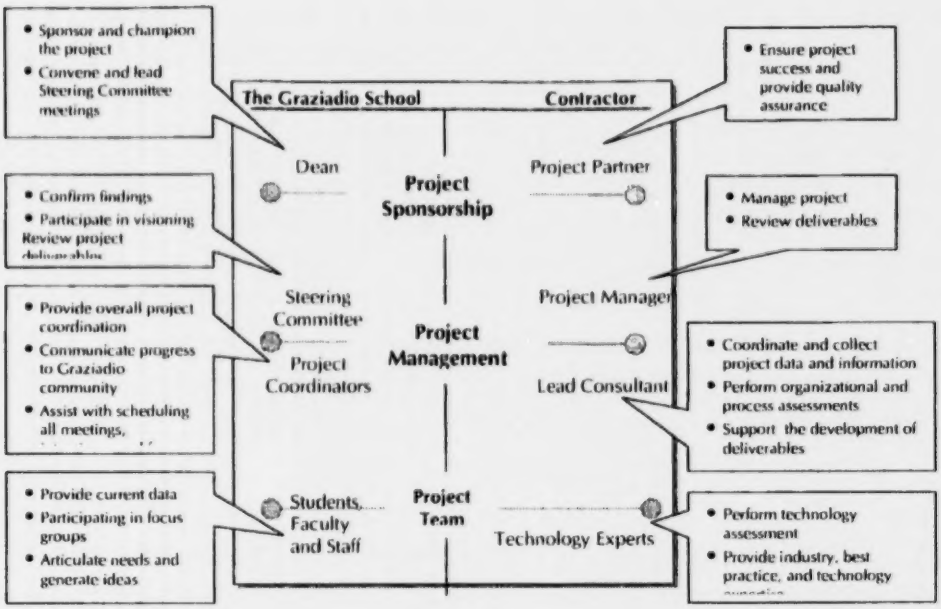

FIGURE 1
Project Roles and Responsibilities

attend to the multitude of details in this type of project is critical. A technology planning project should not be approached like a typical academic study where a committee meets periodically to hash out ideas. Creating a technology plan needs constant attention and should be approached with all the project management tools and skills at your disposal. Giving an open-ended charge to a committee of academics to study technology and come up with some recommendations for the future is a sure-fire recipe for failure in technology planning. Project coordinators should be dedicated to the project or have it as one of their main priorities.

In the structure phase of the SMART planning process, everything possible is done to define personnel roles and create an optimal structure to ensure that the technology plan is produced in the timeliest fashion. For our project we formed a Steering Committee that worked with project managers who coordinated meetings and other aspects of the project in conjunction with the outside consultant. At the same time, the consultant assigned other outside project personnel and technology experts as needed. An organizational chart was drawn up to help define the roles and responsibilities of everyone involved.

Your university and school technology administration structure will determine the makeup of your Steering Committee. Wide representation is desirable (Robb, 2003). Information technology administration at Pepperdine is distributed so from the outset, it was the school's goal to include a very wide range of campus computing representatives on the Steering Com-

mittee. Because any new systems had to interface with the campus network and mainframe it was considered imperative to include representatives from all University-level groups. Representation from other stakeholder groups such as faculty, staff, and administration was considered critical as well to give as wide a range of input and perspective as possible.

DEFINING THE SCOPE

Technology projects have a habit of growing well beyond the original conceptions of the planners (Zimmerman, 2000; Liebmann, 2001). It is important to seek input from a wide-range of potential users once you reach the Assessment phase of the SMART planning process although in the course of the interviews more and more opinions and desired functionality will surface as a result. Therefore, although it is important to collect this input, it is also important to have a set of parameters and guidelines that will keep the project within manageable limits and will insure that the final plan defines a system that can be achieved with reasonable effort and resources.

It is important early on to establish the scope and approach for the technology planning project and insure that the steering committee members and administration keep these in mind throughout the entire project. To this end we defined a charter (Hayes, 2000), set of objectives and a set of deliverables that would come from the planning project. Project objectives included:

- Develop a technology action plan to help the school build a technical infrastructure that supports the following business goals:
  - expands learning and teaching opportunities and effectiveness
  - fosters a learning environment that is current and relevant to business
  - enables the School to operate more "like a business" through the application of technology
- The technology action plan will consider faculty and students' unique needs, such as the need for remote access, a user-friendly system, and adequate support for infrastructure maintenance and training. The technology plan will include recommendations, a rationale, cost estimates, and an implementation plan.

Establishing a list of deliverables early on keeps project members focused and on-task (Rad, 1999). It is also well to establish a set of deliverables for the project to give personnel concrete goals. Our deliverables list included:

- A project charter
- A vision for a more sophisticated IT environment

- A summary of potential benefits
- A set of recommendations for taking advantage of the potential benefits
- A design for the school's new IT infrastructure
- A high-level implementation plan

Included in this phase is the creation of a *project schedule* and a plan for interviewing users. We advocate a rigorous workflow scheduling process based on principles of project management whereby goals are broken down into objectives, timelines, and deadlines are drawn up and specific people are chosen to execute plans and monitor activities and progress toward the goals. Figure 2 shows a project timeline for the first phases of the project.

Just as the project managers and consultant must keep the Steering Committee up to date, the project team needs to establish a school-wide communication plan (Carr, Folliard, 1999) to insure that the rest of the school stakeholders are kept informed of the project's goals and progress.

Major Steps	**Weeks**									
	1	**2**	**3**	**4**	**5**	**5**	**7**	**8**	**9**	**10**
1.0 Organize Project										
1.1 Establish Steering Committee										
1.2 Meet to confirm scope and approach										
1.3 Finalize project plan and schedule										
1.4 Schedule meetings, interviews and focus groups										
1.5 Develop a communication Plan										
1.6 Conduct kickoff meeting										
2.0 Develop vision for information technology										
2.1 Conduct working sessions to develop vision										
2.2 Document vision and guiding principles										
3.0 Conduct Assessment										
3.1 Understand mission vision and key drivers										
3.2 Conduct Interviews and focus groups										
3.3 Synthesize findings and identify benefits										

FIGURE 2
Partial Project Timeline

In this case the communication plan included a schedule of memos to be sent, a newsletter that would be mailed and a series of announcements at meetings. Of course, in any organization there will be some members who "never" seem to receive any news sent in any form so it is well to keep a record of all communications and be prepared to remind these people of the attempts you made to keep them informed. Many schools use web-based communication technologies because the pages can be kept current and available more readily than paper and stand ready as on-going evidence about attempts to communicate.

DEVELOPING A TECHNOLOGY PLANNING *MAP*

Once the organizational structure is in place the second phase of the SMART process, the Planning **MAP** can be developed. The IT planning map establishes the scope of the project and aids in keeping the high level steps of such a process in mind. The Technology Planning Map lays out a series of objectives including:

- Creating a vision for technology
- Analyzing gaps between current and desired technology infrastructure
- Identification of potential benefits
- Creation of a high-level review of IT Infrastructure
- Evaluation of opportunities
- Development of recommendations to take advantage of opportunities
- Rationale and high-level implementation plan

TABLE 1
Technology Planning Map

IT Vision, Role and Goals	*IT Infrastructure*	*Technology Action Plan*
Create a vision for School information technology	Assess existing IT infrastructure	Develop recommendations and define initiatives
Agree on guiding principles that will be used to prioritize investments	Assess best practices	Develop rationale
Identify role for technology and the School's technology goals	Analyze gap between current and desired state	Develop implementation plan
Start →	→	**Goal**

MAPPING OUT YOUR TECHNOLOGY ENVIRONMENT

Besides creating the high level planning map to lay out the direction the project will take, your organization needs to map out your position in the external environment and lay out the boundaries of your internal technology development by creating a technology vision, a set of guiding principles and a list of desired benefits that you expect to accrue from your technology plan implementation.

Our external environment study determined that in the future, management education would be divided into two types of educational providers:

1. *Mass produced, automated, online learning.* This learning will be high-tech, convenient and low-cost. It will be offered to a large number of people.
2. *Boutique-Premium quality, personalized learning.* This type of learning will be "high-touch." It may also be high-tech, full-service, time-efficient, and relatively high-cost. Small classes and a low student-faculty ratio will insure personalized education.

Pepperdine aspired to be in the second category, although it wanted to develop a more sophisticated technology environment to improve its administration of complex degree programs. The Graziadio School also decided it wanted to maintain—and actually enhance—the quality of its education through the integration of technology.

Because it understood that information technology was a moving target, the school quickly realized it was critical to develop an overarching vision of how it might affect management education in the future and then determine how to map traditional school values onto a new information technology infrastructure. The steering committee developed a vision for information technology that embodied the school's educational orientation.

> The Graziadio School values personal interaction. The School also recognizes the potential for technology to foster communication, improve the quality of service, and enhance the learning experience. Technology should not be embraced for its own sake; technology usage should support the institution's mission and strategic goals

A technology vision statement should include the components considered to be most consistent with your organizational values or it is unlikely they will be considered when it comes time to implement your plan. The Graziadio School values small classes to ensure a more personalized education for students. This was stated quite clearly in the vision statement and was kept uppermost in the minds of the planners throughout the project.

Once an over-arching vision was created and the school's position was mapped in the context of the larger educational environment, the steering committee could tune the vision to incorporate more concrete technology goals, objectives, and guiding principles and create a more detailed guide for planning.

GUIDING PRINCIPLES

The SMART planning steps aim to move the organization toward its technology vision by tying it to a set of concrete goals and objectives and guiding principles. The next step in this process involved the definition of guiding principles and objectives for a successful project implementation. The committee first established some general principles to guide the development of new technology including:

User-Friendly Solutions

Technology solutions must be user-friendly and rapidly adopted by students and faculty

Avoid "Bleeding Edge" Technology

Although exciting, new technologies are often costly and unreliable. Moreover, supporting new technologies is challenging, particularly given the unique characteristics of GSBM end-users.

Quick Implementation

The School is eager to make progress on its technology infrastructure and wants to begin the next phase of this project immediately

Affordable

School has limited resources and must find cost-effective solutions

DEFINING SUCCESS FACTORS

As the school set out to look for ways to integrate technology into its service and educational offerings it developed a number of success factors to help determine if the plan produced tangible improvements and would help the School meet its goals. The School determined that the development of a "technology enabled environment" would be successful if:

- The plan is implemented quickly and is affordable,
- Technology solutions are user-friendly and rapidly adopted,
- The process generates buy-in and support within the Graziadio School and the University, and
- Better understanding evolves between the School and the University.

ASSESSING THE NEEDS OF USERS AND THE TECHNOLOGY INFRASTRUCTURE

The next phase of the *SMART* process is to **Assess** the needs of users and turn that assessment into a list of issues that need to be addressed by technology. There also needs to be a high-level assessment of the existing technology infrastructure, best technology practices and an analysis of the gap between the existing and desired infrastructure. Any successful technology implementation is dependent on user acceptance, so it is imperative that the project team assesses the needs and perspectives of the potential user groups of the new technology (Ambler, 2002). The goal of this phase is to define a target technology infrastructure by examining excellent examples already in use in other organizations, the needs of your organization's potential users and the difference that exists between your current infrastructure and the one you desire.

Each individual and group interviewed will provide data that can be translated to functional specifications for new technology. An extensive schedule of interviews, focus groups and surveys was drafted and all major stakeholder groups were consulted to determine the needs of the various groups within the school.

Interviews and focus groups conducted with students were quite enlightening and uncovered some interesting insights. It was generally found that students thought that the school technology infrastructure was inadequate and that they desired more access to integrated information resources. The student perspective included the following issues:

- Existing technology does not support the learning experience
- Personal attention from faculty and staff is valued but increased reliance on electronic access to information and technology tools are needed.
- Strengthen ability to communicate and collaborate

Faculty of course had a different set of perceptions about technology. Because many faculty did not have a lot of experience with technology the committee set out to get a general feeling for what the faculty valued about the traditional teaching and learning environment at Pepperdine. The fac-

ulty felt that any new technology should support the traditional strengths of the Graziadio teaching program including these core values:

- The freedom and ability to create and re-formulate classes as the situation and opportunity dictates,
- Real-world orientation of teaching,
- Continued face-to-face contact and small classes, and
- Personal contact with students and availability of individualized attention

As more user groups were interviewed it became clear that what started out as a general administrative desire to improve educational and administrative technology needed to give way to a more specific vision of a system that supported information access, knowledge exchange, collaborative learning and teaching, and administrative activities.

Interviews with staff produced yet a different perspective. Staff tended to focus on access to data as shown by the issues that were identified in their interviews:

- Administrative support is highly dependent on University level services, policies, systems and resources.
- Staff are hindered by manual processes, distributed database development, distributed maintenance, and inadequate storage procedures. Data are dispersed among multiple data systems

TECHNOLOGY ASSESSMENT

Through interviews and focus groups a whole set of issues related to technology use surfaced and it started to become clear that large revisions in the technology infrastructure were needed before any type of new information system could be implemented. Interviews with students and other and potential users will help identify the universe of desired features and the functionality people need to accomplish tasks and goals but other assessments are need as well.

Besides the assessment of user needs it is important to do an assessment of the current technology infrastructure and compare it to best-practices among comparable or competitor organizations or an industry if you are interested in having your technology solution reflect business practices. A high-level network assessment should be a part of most projects and is a must for any technology project that uses networked resources or the Internet. No new application or technology project can succeed if users have to endure degraded access time.

Technology consultants looked at the overall University network and the school's connectivity as part of the technology assessment. Network speeds, bottlenecks, types of connections, and levels of service as well as external and internal service providers were catalogued. This assessment provided important information to the school about the need for new forms of cooperation with the University Information Resources (IR) group

It is important to research and provide benchmarks so a best practice analysis was designed to show how other business schools were using technology and the kinds of services they provided. A technology survey was drawn up for our study and competitor schools were evaluated to determine their status in relation to the following items:

- What kind of computing facilities are available to the students?
- What kind of access to business information is provided to students?
- What kind of IT support does the University provide to the students?
- What kind of computing facilities are available to the students?

TABLE 2
Comparative Analysis of IT Budgets and Staffing

School	*Require Laptop?*	*No. of Users*	*IT Organization (# of FTEs) (excludes Univ IT)*	*Ratio (Users: IT Staff)*	*IT Budget (excluding University IT)*
The Graziadio School	No	3000	13	1:230	Approx. $800,000
Eastern School	No	1650	20	1:83	
Large Eastern School	No	2800 graduate; 2000 undergrad	40	1:120	
Western Competitor	Yes	1250	27 (total unit size is 35 when combined with library)	1:46	$3.3 million annual
School with Large IT Infrastructure	Yes	1300	15	1:87	$3 million
School with Large Distance Learning Program	Yes	505	15	1:34	
Prestigious Business School	Yes	2600	69	1:38	Initial investment of $11-20 million

- Is there a requirement for students to purchase a computer prior to starting at the University?
- How effectively does the University use the Internet to attract students?
- What kind of technology do Professors have access to and use in their instruction?

Because a laptop requirement was being considered, data was collected from other schools to help make decisions about the impact on costs and resources while other data were collected to give a sense of what other schools were spending and how they were staffing their IT implementations.

MAKING *RECOMMENDATIONS*

With the data and perspectives derived from the Assessment phase interviews and focus groups the project can now move to the *Recommendation* phase of the SMART planning process and translate needs into concrete technology recommendations. The Assessment Phase interviews showed that the school's technology environment needed administrative, personnel, and structural improvements. Surveys and interviews of potential users of technology invariably produce a list of issues, some negative and some positive. The next step is to do a more thorough analysis of the issues identified by users in an attempt to discover root causes for the current situation and obstacles to achieving the school's technology vision. Our analysis of the issues identified in the Assessment Phase led to the conclusion that the School and University technology strategy, supporting organization, and policies had not kept pace with the rapid rate of change in computing. Upon further analysis the root causes (Figure 3) of the issues identified in the various interviews and focus groups were identified as a lack of prioritization and strategic planning and an organizational misalignment of funding, responsibility, and accountability.

Based on the issues, the root cause analysis, and the vision for technology, the School was able to identify five "resultant needs" (Figure 4) for improving the school's information infrastructure. As can be seen from the process thus far, the resultant needs are the end product of a continuous sequence of refining steps. Informed by an assessment of current technology that was described in the last section, the resultant needs will form the basis of the recommendations for the technology plan.

The five resultant needs derived from the root cause analysis were developed into sixteen preliminary recommendations (see Table 3). These recommendations were high-level but provided a series of objectives that the future infrastructure and organization would have to support.

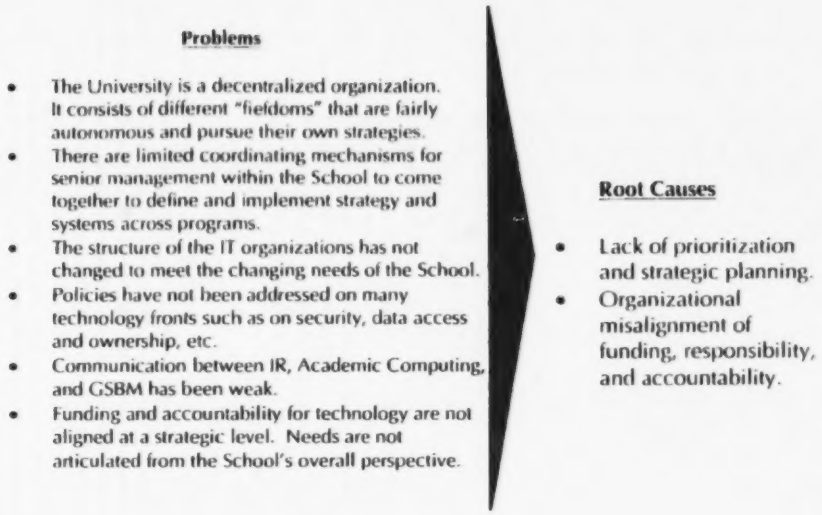
Problems
The University is a decentralized organization. It consists of different "fieldoms" that are fairly autonomous and pursue their own strategies.
There are limited coordinating mechanisms for senior management within the School to come together to define and implement strategy and systems across programs.
The structure of the IT organizations has not changed to meet the changing needs of the School.
Policies have not been addressed on many technology fronts such as on security, data access and ownership, etc.
Communication between IR, Academic Computing, and GSBM has been weak.
Funding and accountability for technology are not aligned at a strategic level. Needs are not articulated from the School's overall perspective.
Root Causes
Lack of prioritization and strategic planning.
Organizational misalignment of funding, responsibility, and accountability.

FIGURE 3
Root Cause Analysis

At this point it was important to translate the recommendations into initiatives the school could undertake to improve its use of technology. It should be noticed that, in this case, the recommendations and initiatives address all facets of the school information infrastructure including: classroom and lab environments; student computer access; software; technology staffing and management. This multi-faceted perspective for revising so many elements of the technology infrastructure was a direct result of the information produced by the SMART Planning Process.

Ten initiatives were produced from the preliminary recommendations. Initiatives were developed that could enable the School to develop a Technology plan (the final phase of the *SMART* planning process) that

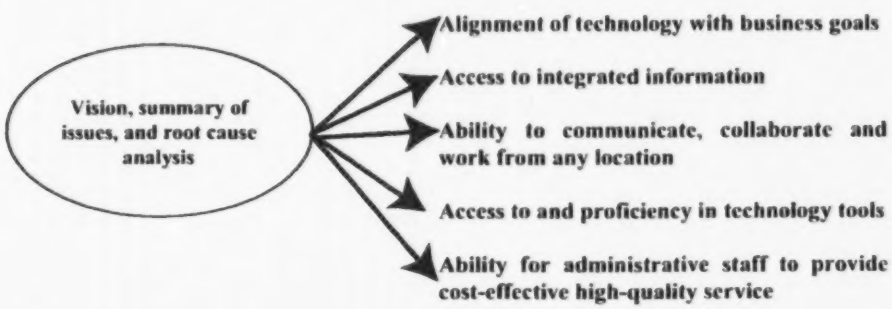
Vision, summary of issues, and root cause analysis
Alignment of technology with business goals
Access to integrated information
Ability to communicate, collaborate and work from any location
Access to and proficiency in technology tools
Ability for administrative staff to provide cost-effective high-quality service

FIGURE 4
Resultant Needs

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TABLE 3
Recommendations for Technology Planning

Alignment of technology with business goals	• Upgrade technical infrastructure and applications • Improve technology planning, organization, budgeting and accountability
Access to integrated information	• Improve student and faculty access to knowledge • Improve access to School and University information and enable online student services • Integrate information and manage knowledge
Ability to communicate, collaborate and work from anywhere	• Create standards and policies for communication tools and methods • Enable end-user connectivity from anywhere • Implement videoconferencing
Access to and proficiency in technology	• Increase student, staff and faculty literacy in technology • Provide instructional technology support for faculty • Improve physical environment of classrooms and computer labs • Make policy decision on student access to a PC
Ability for administration to provide cost-effective, high-quality service	• Improve scheduling process and technology • Gain access to University and administrative systems • Plan for future administrative computing systems

addressed the array of components that comprise the school technology infrastructure. The ten initiatives developed included the following:

1. **Computer Standards: Student Access.** Recommend student laptop usage and undertake a pilot study in the next Academic Year
2. **Computer Labs and Computer Classrooms.** Upgrade desktop computers and move to a distributed computing environment that utilizes teamwork spaces.
3. **Classroom Environment.** Retrofit existing classroom facilities with electricity, lighting, and VCR/overhead projectors in the short-term.

4. **Software Platform.** Software can be categorized in four areas:
   - *BackOffice Software:* Depend on the University for the underlying technology software platform. Conform to the University's standard Microsoft products.
   - *Desktop Software:* Extend the Microsoft Campus Agreement to cover students.
   - *Collaboration and Learning Platform:* Conduct a review to select a learning and collaboration platform for the School. Implement the new platform.
   - *Administrative Applications:* Work with IR to deploy Campus Pipeline to provide access to online student services.
5. **Connectivity.** Provide Internet connectivity to faculty and staff
6. **Network Management.** Negotiate a Service Level Agreement (SLA) with IR.
7. **Data Center Management.** In source data center activities to IR. Outsource web site hosting to a third party vendor.
8. **Videoconferencing.** Implement a videoconferencing system
9. **Leadership and Organization.** Create a senior technology position
10. **Technology Literacy.** Develop technology education programs

ARRIVING AT A *TECHNOLOGY ACTION PLAN*

The final phase of the *SMART* planning process—linking the 10 new technology initiatives derived from the guiding principles, goals and needs and the IT vision (see Figure 5)—produced a Technology Action Plan.

Graziadio School Mission, Values, and Strategic Goals
IT Guiding Principles
Graziadio Connect Initiatives
Student Computer Access
Technology Literacy
Software Platform
Computer Labs and Classroom
Classroom Environment
Leadership and Organization
Video-conferencing
Connectivity
Data Center Management
Network Management
IT Vision
1) Extend the reach and scope of the Graziadio School business model.
2) Prepare students to be effective professionals in a knowledge economy.
3) Use technology to enable the School to "run like a business"

FIGURE 5
Technology Plan Initiatives

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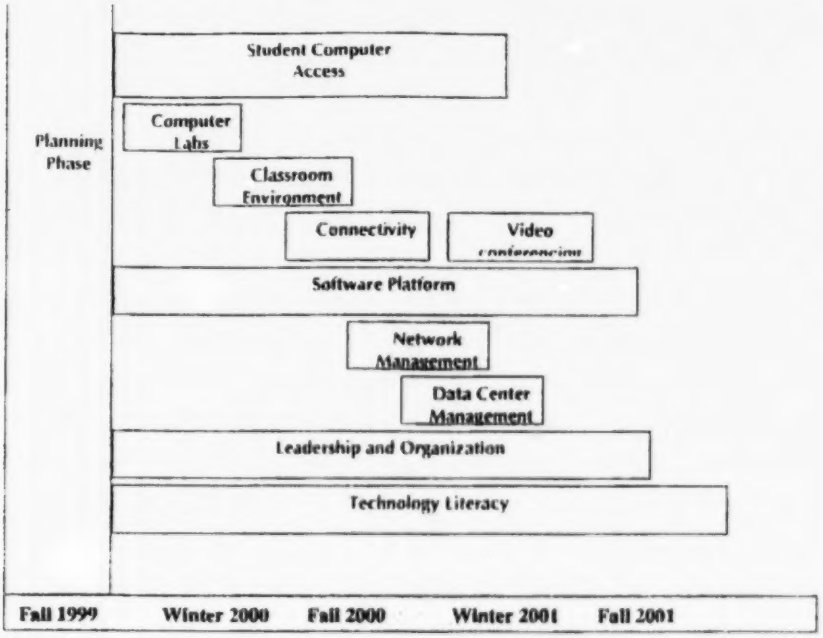

FIGURE 6
Technology Action Plan Schedule

The technology action plan should lay out a development schedule for all the initiatives. Our Technology Action Plan considered faculty and students' unique needs, such as the need for remote access, a user-friendly system, and adequate support for infrastructure maintenance and training and also addressed "back-office" issues to enable more effective administrative processes. The plan is shown in Figure 6.

IMPLEMENTATION

Many times, even though organizations pay attention to detail in the planning stage, project management processes are not followed so rigorously when it comes to implementing a solution. It is imperative that initiatives be approached as separate projects and that components such as

- Initiative Background,
- Recommendation(s),
- Cost Estimates, and
- Resource Requirements

are specified for each just as they were in the planning stages.

Figure 7 is a schematic of elements that should be contained in each initiative implementation process

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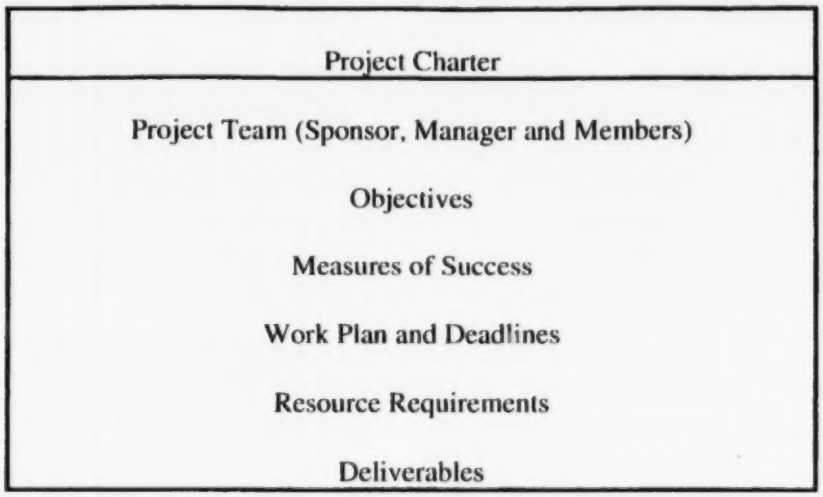

FIGURE 7
Initiative Project Elements

TRANSLATING NEEDS INTO A NEW INFORMATION TECHNOLOGY INFRASTRUCTURE

Having worked through the steps of SMART, the School gained a better perspective on its technology needs. From the range of the 10 initiatives it should be obvious that the effort to improve our technology required a broad overhaul of our whole technology infrastructure. Providing upgraded labs and classrooms and subsidizing software applications and Internet access for faculty raised the general consciousness level about technology and made a statement about its importance. Improvements in network bandwidth and efficiency, data center and web site management along with changes in staffing provided a much more efficient and effective infrastructure to support subsequent projects such as a new learning and collaboration software platform.

Bringing New Technology to Bear on Management Education

Having traced the steps through the SMART Planning Process we would like to briefly describe the implementation of one initiative, a learning and

TABLE 4
Learning and Collaboration Software Implementation Plan

Implementation Steps	*Timeline*	*Expected Outcome*
1. Learn about vendors and product capabilities • Research marketplace for collaborative technologies • Invite vendors to present demonstrations • Compare product approaches and capabilities • Conduct informational interviews with other schools and universities using products	Fall 1999	Understanding of market technologies
2. Refine definitions of necessary functionality for School	Winter 1999-2000	Description of functionality that is required for product(s)
3. Generate Request for Proposals and evaluate company proposals	Spring-Summer 2000	License and software to use
4. Select a learning platform and purchase • Compare functionality and costs (direct and support) of each solution • Select and purchase a platform • Final needs analysis • Tailor solution to School needs	Winter 2000-2001	License and software to use
5. Implement • Train users • Develop content • Recruit staff (or outside firm) to maintain • Roll-out to faculty, staff, and students • Communicate lessons learned with other schools	Fall 2001	Commence implementation phase

collaboration software platform to illustrate how we moved from planning to implementation of one of the initiatives. To complete the chapter we will provide some information that we hope will help other schools in adapting the SMART Planning Process to their needs.

A working group was chosen and charged with developing a set of recommendations for a new learning and collaboration software platform. A project charter was created and objectives, a work plan and deliverables were specified (See Table 4 for project schedule).

The working group examined a number of courseware and other collaboration software packages but they soon realized that they were all miss-

ing a component that made them inconsistent with one of the hallmarks of a Graziadio business education—none were real-world business applications. Besides looking for a flexible package that would provide the desired collaboration and information management features, the committee was interested in obtaining a platform that was actually used in the corporate world. The working group recommended that the school look for a collaboration and learning platform that would allow students to receive hands-on experience with a system that is actually used in corporate America in keeping with the Graziadio School's focus on real-world business applications.

From the School's extensive needs analysis it was clear that we needed a flexible tool that could handle:

- Knowledge management and access to multiple sources of information,
- Links to eLearning and class content,
- Consolidation of multiple information tools such as e-mail and calendars, and
- Class administration and information management

A final specification list was drawn up and functionality was listed in an RFP (Request for Proposals) that was submitted to vendors. The functionality list covered needs derived from the SMART Planning Process interviews and needs assessment of all user groups (see Table 5).

After much research and an extensive RFP process, the School found that no single solution could meet the needs as defined by the SMART process. However, one proposal from a systems integration company showed how corporate portal technology could be adapted to meet our needs by integrating collaboration and workflow support software into the portal technology functionality. Many businesses are becoming interested in systems integration companies (Alexander, 2002) over single system vendors and we recommend that schools that are short on staff but have a reasonable budget to spend on a project investigate systems integrators. Our project certainly benefited from our systems integration company's breadth of vision.

A corporate portal brings together under a standard web-based interface content, applications and services from incompatible platforms (Griffy-Brown & Fletcher, 2000). It can serve as a single point of access to:

- Enterprise applications
- Documents and Web pages
- Internet services
- Collaboration Tools

TABLE 5
Desired System Functionality

Students	*Faculty*	*Administrative staff*	*Course Scheduling*
Individual alerts when course information has changed	Form-based input of course files from word processing, spreadsheet and presentation software	should have access to same productivity, collaboration and communication features available to the students and faculty	Should be able to analyze courses completed by individual students (mainframe data) and project the most appropriate course offerings
Student-to-student and student-to-faculty synchronous and asynchronous communication	Customizable Gradebooks	Ability to create group mailing lists and class rosters based on student data.	Class schedule needs to take into consideration recommended sequencing of courses, faculty resources, and facility limitations
Support for one-to-one and group online collaboration and sharing of documents	Class rosters	assist faculty by adding course material	Reports need to be produced showing the full-time teaching loads for each of the programs, by the nine disciplines and by location.

Personal and group storage space	Support creation of interactive exercises and assessment	Web-based access to student data housed in University mainframes with ability to check student progress on a daily basis	Teaching dates are supplied and the system will check for duplications/conflicts regarding workshops, holidays, weekend dates, etc
Project tracking and other team support	Support creation of item test banks	Ability to up-date School-wide calendaring and news system	The class schedule is frequently updated and all checks and balances need to be in real-time
Access to individual student progress data	Multimedia libraries with content that can be used for online assignments	Access and information for prospective students	
Access to library databases from within the system with no second log-in		Centralized repository for historical and current data for admission, enrollment, and student demographic and academic statistics	

Companies ranging from traditional manufacturing and retail to services and Internet companies are using business portals to create efficiencies both inside their companies and with their suppliers and partners. Portals provide business users with integrated, personalized, and web-based interfaces to business content. Furthermore, this occurs in a single, consolidated customizable view that is secure. A portal is distinct from a web-interface or campus intranet applications such as Campus Pipeline in that it is:

- Customizable by the user,
- Searchable,
- Provides publishing and categorization services,
- Automates workflows,
- Is a single point of control for securing internal business content plus external/internal business intelligence,
- Provides collaboration and groupware capabilities, and
- Includes delivery and notification services.

If you will recall from the section on *Needs Assessment* our students, faculty and staff were looking for technology to support them in a number of different areas including: access to integrated information; collaboration and communication and a continuation of the school's focus on individualized student attention. Our implementation of corporate portal technology dubbed *The GraziadioNet* was designed to meet the needs of students, staff and faculty in the areas of education, administration and support. Fortunately, the SMART Planning Process gave us much-needed data about the needs of our potential users. Furthermore, the specification and design of a system was guided by the constraints and requirements identified in the SMART process. When it came time for a choice of platforms, portal technology linked with a collaboration package was the clear choice to meet the needs identified by the SMART process.

When we started our process corporate portals were not widely used but today there is much investment from business and growing academic interest in portal technology (Connolly, 2000; Frazee, 2001). A number of universities are implementing portal technology for a wide range of reasons (Ethridge, Hadden & Smith, 2000) including the ability to personalize the information and the educational experience (Hamlin, 2000; Strauss, 2002), improve communication and collaboration (Katz, 2002) and access to student services (Lightfoot & Ihrig, 2002)

Importantly, the Graziadio School of Business used the SMART technology planning process to identify and reach technology goals such as implementing a business portal. Because of this process, the Graziadio School was able to successfully implement a business portal enabling the school to provide tools to position us for the future. This process also prepared a

foundation for continually addressing the ongoing technology challenges inherent in the current complex and turbulent business environment

In consideration for space limitations we have presented a rather schematic view of our planning process. Clearly, as with any project all was not clear sailing and there were obstacles and problems along the way. Although we did not address them in the body of the chapter we would like to address some in the conclusion in the form of a "lessons learned" list.

- **Wide Representation in the Planning Process.** Include as many campus technology players and providers on your Steering Committee and keep them close to the planning process. Identify all stakeholder groups and make sure they are represented
- **Over-Communicate.** Continuously communicate goals and progress to your organization. About the time that you feel you are becoming redundant will be about the time that some people are first hearing of your project.
- **Manage Expectations.** Related to the last item but the focus here is on continuous monitoring of your audience's understanding about your project and what they think it will do for them. Downplay the anticipated effects of the new technology and remind people that no technology works correctly the first time.
- **Focus, Measurement, Delivery**. Use the SMART Planning Process identification of goals, objectives and guidelines to keep you on target. Create test situations to measure your implementation at many steps along the way. Set goals and make sure you deliver technology on or before stated deadlines.
- **Plan for Over-Capacity Based on Your Original Use Estimate**. If your needs assessments and technology implementation is successful users will integrate it into their work processes and may even find new uses for it you did not anticipate. Always overestimate traffic and build in over-capacity
- **Perpetuation of Values, Execution on Goals**. Successful implementations of technology build on established organizational values. People resist change so there has to be some connection of the new with current methods or beliefs about what is important.
- **Pilot and Departmentalize Roll-Out**. Every technology roll-out encounters unanticipated obstacles. Increasing the number of users involved in a roll-out increases the number of potential problems. Keep initial roll-outs small and try to compartmentalize the process so you can efficiently monitor the impact on users
- **Training and Planning**. Even the most intuitive technology needs to be supported with instructions and training presented in a multitude of media. Handouts, online tutorials and classroom training sessions should be designed and ready to deliver before the roll-out of the technology.

NEXT STEPS

Although most initiatives derived from the planning project including the GraziadioNet Business Education Portal have been implemented, we are still assessing outcomes. We plan to follow-up with assessment of outcomes taking a second look at our technology infrastructure now that the changes and new portal are in place.

What is clear from initial qualitative analysis is that gains continue to be made in the student, staff and faculty experience. Business processes have been rethought and are being streamlined and automated. Committee and program work as well as decisions are being archived so that institutional learning takes place. Students and faculty can collaborate and communicate more easily balancing work, travel, family, and business school demands. Students or faculty who are traveling on business can continue to work on assignments with classmates. It is our goal to use these tools to further improve quality assurance ultimately enhancing the student and faculty academic experience even more. With this goal, the Graziadio School's Learning Resources Committee has taken on the task of putting in place ongoing learning evaluations in addition to the student evaluations currently in place. We look forward to continual improvement with more quantitative evaluation of outcomes now that processes such as the SMART process are in place. Ultimately, it is the synergies between process and technology improvement that enables real-world technology to have its greatest impact on the management education classroom.

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APPENDIX 1- SMART CHECKLIST

- Do you have the right organizational structure? Your committee and project structure will vary depending on the scope and goal of your project. For instance you may choose to create a Steering Committee and several working groups that will focus on single issues and bring their findings back to the main body for deliberation. As much as possible though, working groups should be headed by staff or others who are involved with the activity or technology they are investigating.
- Have you identified project managers or working group leaders who can dedicate enough time to the project to keep up momentum?
- Have you identified the scope, schedule and desired outcomes of the project?
- What is your plan to insure that all members of the main committee or working group understand the scope, schedule, and desired outcomes?
- What is your plan to insure that all members of your organization are kept up-to-date on the progress, goals, and milestones of the project?
- Does your technology planning road map contain enough detail to guide your planning process?
- Have you identified all of the potential stake-holders in the organization who might be effected by the new technology?
- Does your plan contain a high-level review of the existing technology infrastructure?
- Once you are ready to move to the implementation stage for you initiatives have you done enough specification of each? Are you treating each as an individual project?

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